JUNE, 1956

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

Gaging Tapered Holes • Press Safety Controls •
Designing Matched Metal Molds • Better Spar
Milling • Magnetic Dies • Automatic Inside Welding

Complete Editorial Index . . . p. 64 New Products . . . p. 174 Helpful Literature . . . pps. 134 & 172

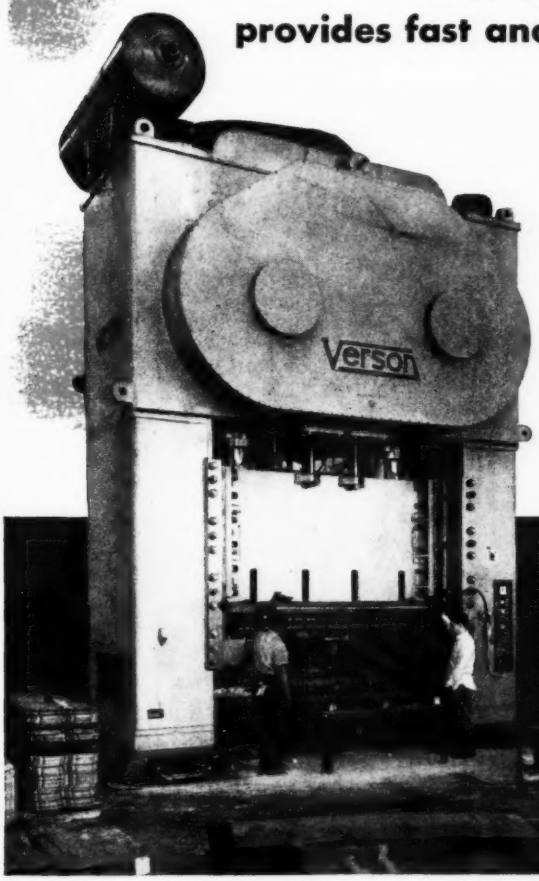
Verson

1800 TON PRESS

with front to back cranks
provides fast and efficient blanking

Here's how to do large area blanking or forming in a crank press without using a long crankshaft—use two cranks in a front-to-back arrangement. This is another example of how Verson builds better, more dependable performance into their presses.

Write for the complete story of Verson Presses . . . and if you wish specific recommendations, include an outline of your requirements.



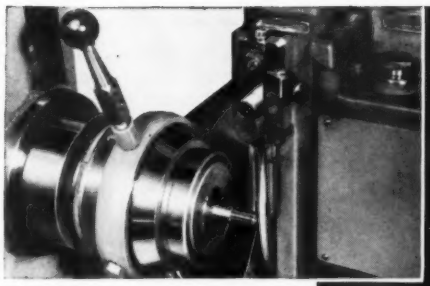
Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION
VERSON ALLSTEEL PRESS CO.
9335 S. Kenwood Avenue, Chicago 19, Illinois
So. Lamar at Ledbetter Drive, Dallas, Texas

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES
TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

Rotating or non-rotating

performs equally well!



Accuracy obtained on this thread grinding operation eliminated need of holding between centers.

Tapping to extremely close tolerances on a difficult job.

All users are unanimous in reporting the all-purpose value of the Levermatic. Not only is it *accurate* and *fast*, but it is exceedingly *versatile*. In fact, jobs that are turned or faced can be threaded or milled without removal from the chuck.

The Levermatic provides *instant* internal and external gripping and releasing (with no stopping of spindle on bar or arbor work)! Faster, more accurate machining at lower costs! For every type of standard and special machine.

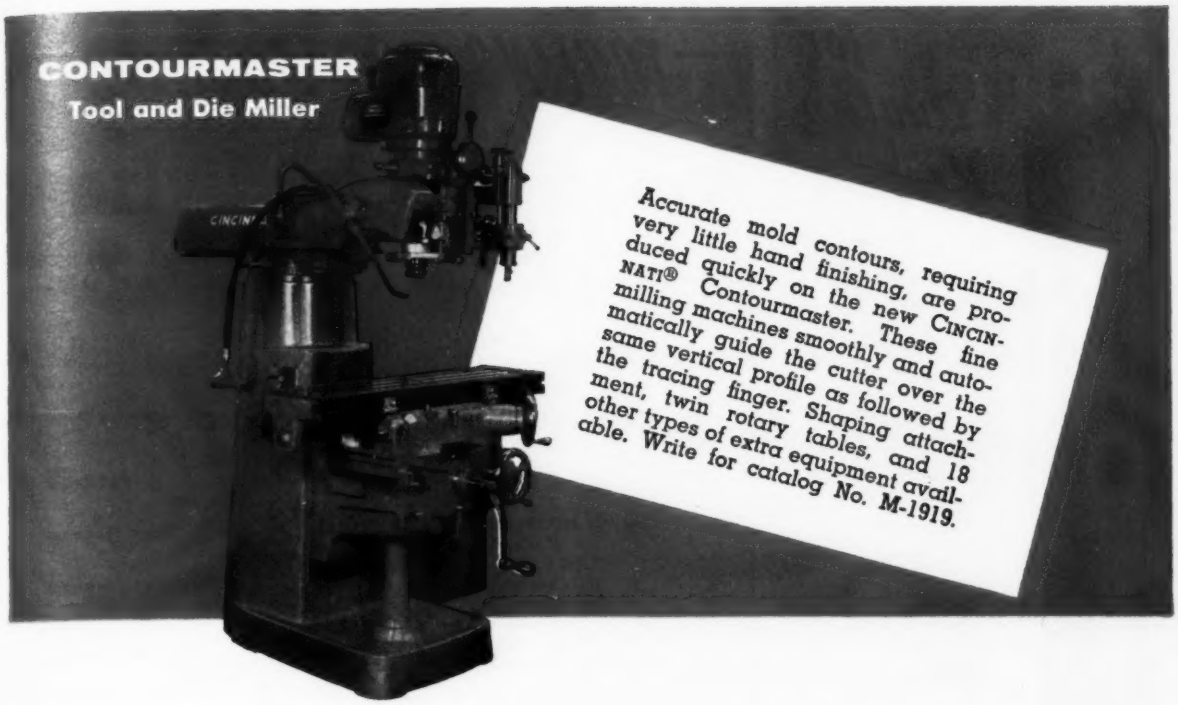
Send for Catalog

Learn how practical the Levermatic would be in your shop by seeing how other users have applied it to their jobs.

RUNS AS TRUE AS THE SPINDLE

Sutton Tool Company

STURGIS, MICHIGAN


CONTOURMASTER
Tool and Die Miller
Accurate mold contours, requiring very little hand finishing, are produced quickly on the new CINCINNATI® Contourmaster. These fine milling machines smoothly and automatically guide the cutter over the same vertical profile as followed by the tracing finger. Shaping attachment, twin rotary tables, and 18 other types of extra equipment available. Write for catalog No. M-1919.

They Give You

A BIG ADVANTAGE

In Making Fine Dies and Molds

Cutters for milling die and mold contours are sharpened in one chucking on CINCINNATI® Monoset Cutter and Tool Grinders. And you can make small intricate cutters . . . grind them complete from solid bar stock . . . when you need one in a hurry. The Monoset has many desirable features for sharpening ordinary cutters, too. Get the complete story in catalog No. M-1591-2.
CINCINNATI
MONOSET
Cutter and
Tool Grinder
CINCINNATI
MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID
THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 3

for Quality Reamers

stands alone

The Reamer Specialists

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-1951

George J. Huebner, Founder

VOL. XXII—No. 3 JUNE, 1956

Editorial 63
Complete Index 64

EDITORIAL STAFF

GEORGE J. HUEBNER . . . . . *Editor-in-Chief*
E. WILLARD PENNINGTON . . . . . *Editor*
WATSON N. NORDQUIST . . . . . *Managing Editor*
CARL F. BENNER . . . . . *Associate Editor*
WILLIAM E. HOFFMAN . . . . . *Associate Editor*
CAROL E. REUSS . . . . . *Associate Editor*
JOANNE FROLO . . . . . *Assistant Editor*
ERNEST J. URBAS . . . . . *Contributing Editor*

BUSINESS STAFF

R. L. HUEBNER . . . . . *Publisher*
C. A. HURT . . . . . *Sales Manager*
P. E. HAGER . . . . . *Production Manager*
E. J. BROOKS . . . . *Sales Development Manager*
B. C. JACKSON . . . . . *Research Manager*
E. N. DeCAPRIO . . . . . *Contract Manager*

REGIONAL REPRESENTATIVES

ALTADENA, CALIF., M. D. Pugh, 2721 N. Marengo Ave. . . . . SYcamore 7-2894
CHICAGO 1, Robert R. Pierson, 333 N. Michigan Ave. . . . . FRanklin 2-4811
CLEVELAND 18, Jerry J. Miller, 1975 Lee Road . . . . . FAirmount 1-4040
DETROIT 2, R. F. Pickrell, 318 Stephenson Bldg. . . . . TRinity 1-0790
NEW ENGLAND, R. N. Jorgenson, P. O. Box 55, Granby, Conn. . . . . OLdfield 3-6759
NEW YORK 17, H. Thayer Heaton, 141 East 44th St. . . . . MUrray Hill 2-1647

TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

U. S. Subscription rate, $2.00 per year for the above described individuals. For schools, libraries, and other individuals, $6.50 per year. All foreign subscriptions, $10.00 per year. Single copies, $1.00 each.

MEMBER OF BPA

Copyright 1956
by Huebner Publications, Inc.

Accepted as Controlled Circulation Publication at Louisville, Ky.

Published Monthly by HUEBNER PUBLICATIONS, Inc.

Editorial and Business Offices:
1975 Lee Rd., Cleveland 18, Ohio
Fairmount 1-4040

Ship plates ONLY to:
Printing Office:
112 East Chestnut Street
Louisville 2, Kentucky

GEORGE J. HUEBNER . . . . . President
R. L. HUEBNER . . . . . Secretary
R. R. HUEBNER . . . . . Treasurer
GEORGE J. HUEBNER, JR. . . . . Director

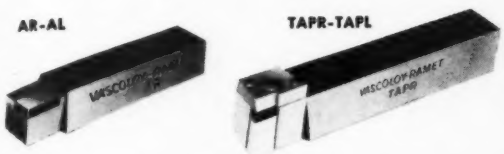
PUBLISHERS OF: Tooling and Production ★ Die Designing and Estimating Plastics Molds ★ The Know-How-Library of Tooling and Production

Huebner Publications, Inc.

NOW---V-R Toolholders to Replace Nearly Every Standard Brazed Tool

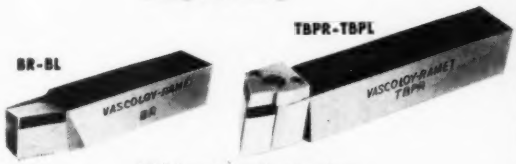
Standard Carbide Tipped Brazed Tool | **Comparable Standard Toolholder with Carbide Throw-Away Insert**

AR-AL — TAPR-TAPL



Straight Turning

BR-BL — TBPR-TBPL

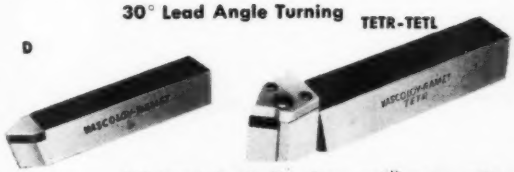


15° Lead Angle Turning

E — TDTR-TDTL

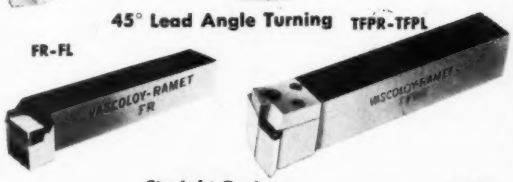
30° Lead Angle Turning

D — TETR-TETL



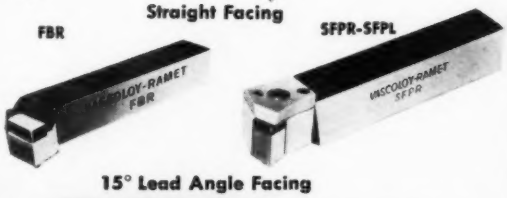
45° Lead Angle Turning

FR-FL — TFPR-TFPL



Straight Facing

FBR — SFPR-SFPL

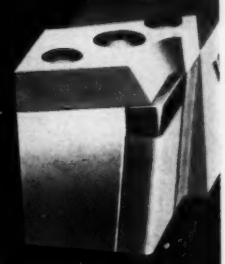


15° Lead Angle Facing

...You Can Save 10% to 200% on 90% of Your Machining Operations

New 6° Positive Rake Toolholders

offer big savings when machining materials requiring positive rake tools, such as aluminum, soft brass, copper, bronze, stainless steel and alloyed steels. Styles for straight or 15° lead angle turning and facing as well as plunge turning are available.



No Grinding when you use V-R toolholders and throw-away inserts!

Less Downtime because you do not have to reposition the toolholder when you change or index inserts!

Less Carbide Inventory because you get six or eight cutting edges per insert at pennies per edge with negative rake toolholders!

Lower Carbide Cost because you eliminate carbide waste. You can consume up to 90% of a long insert with a V-R toolholder, nearly twice as much as with any other!

Faster Tool Changes because one main screw controls clamping of the insert—nothing to fall out or require readjustment!

Long-Life Chipbreakers. V-R chipbreaker plates are made of a special cast alloy (not steel), chosen for its exceptional wear and shock resistance characteristics.

ASK FOR NEW TOOLHOLDER CATALOG

24 pages of data on V-R negative and positive rake toolholders and V-R carbide inserts—triangular, square and round throw-away and 1½" lengths. Call your local V-R Representative or Distributor, or write Vascoloy-Ramet today.

MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

892 Market Street • Waukegan, Illinois

TH-577

CIRCLE INFORM-A-GRAM KEY NO. 5

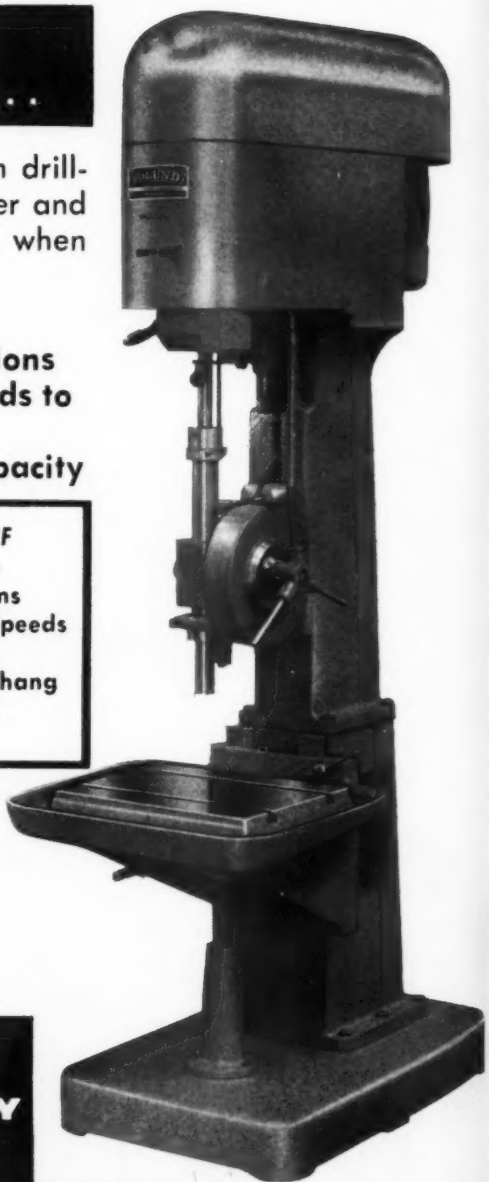
Now! EDLUND "F" SERIES

Infinitely Variable Speed

DRILLING and TAPPING MACHINES

The Right Machine for You . . .
For Your Job . . . For Your Product . . .

Sensitive, medium, or heavy duty production drilling and tapping operations all become easier and faster with lower costs and fewer rejects when Edlund "F" Series machines are used.



Edlund Model 4F
For Heavy Duty Operations
Infinitely Variable Speeds to 2000 RPM
12" Overhang, 1¾" Capacity

Edlund Model 1F	*Edlund Model 2F*
Extreme Sensitivity	For Medium to Heavy Operations
Infinitely Variable Speeds to 10000 RPM	Infinitely Variable Speeds to 3600 RPM
Micrometer Graduated Depth Gage to .001"	8"–12"–15" Overhang
Adjustable Spindle Tension	1¼" Capacity
7" Overhang, ⅜" Capacity	

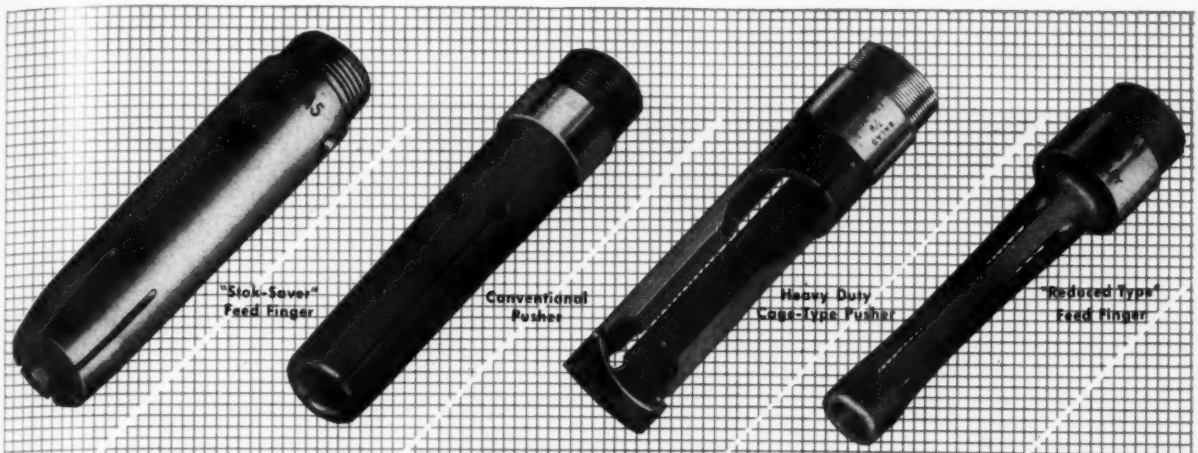
Infinitely variable spindle speeds, rugged construction, and rapid production features make Edlund "F" Series machines the logical choice for plant expansion and replacement of obsolete equipment.
Write for descriptive Bulletins today.

America's Most Popular Drilling Machine

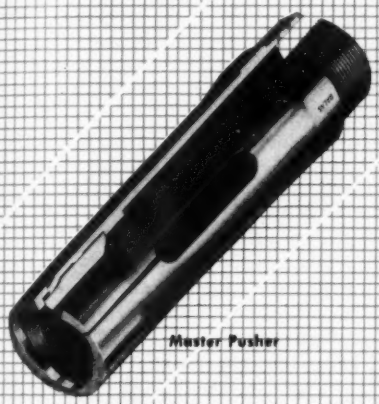
EDLUND
MACHINERY COMPANY
Cortland, New York
DIVISION—PRECISION CASTINGS CO., INC.
SUBSIDIARY—HARRISBURG STEEL CORPORATION

EDLUND Representatives in major cities

CIRCLE INFORM-A-GRAM KEY NO. 6



increased production—less waste with BALAS PUSHERS



Write for our special offer on Balas Master Pusher and Pad Kits for all popular sizes of B. & S. Machines. Save time and money by having what you need on hand.

Unusual performance records set by Balas Pushers prove they help produce better products at lower costs, with less stock waste. They're made of selected tool steel, accurately machined, carefully heat treated and thoroughly tested to provide proper tension and smooth feeding.

Selection and use of Balas Pushers whether solid, adjustable or Master type, is vital in reducing your cost per piece and increasing your output.

Model "A" Master Pusher illustrated at left has formed key to hold pads securely in place. New rocker ring permits pads to adjust themselves to a full bearing on bar... avoids scoring of stock. With this new design, pushers and pads last longer... work better.

There's a Balas Feed Finger or Pusher for every size, shape or type of material... for every job, easy or tough... and for scratch-less operations. Order from our large stock for immediate delivery. You'll do more... you'll do better with Balas.

THE BALAS LINE INCLUDES: Master Collets and Pads • Pushers and Feed Fingers • Master Pushers and Pads • Ejector Collets • Conventional Collets • Carbide-faced Stock Stops for B. & S. Machines • Collet Sleeves and Chuck Nuts for B. & S. Machines.

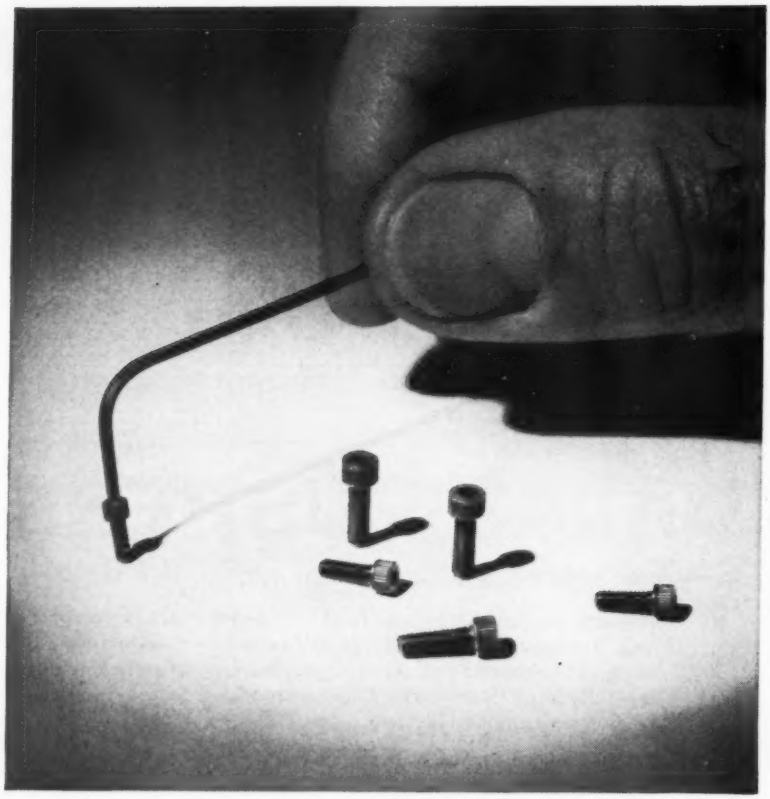
BALAS COLLET MANUFACTURING CO.

Cleveland 14, Ohio

REPRESENTATIVES: George Britton, Brockport, N. Y.; Bert Lewyn, Atlanta, Georgia; L. R. Christiansen Co., Moline, Illinois; Eugene H. Cooper Co., Hopkins, Minn.; Tri-Tex Machine & Tool Co., Houston, Texas; Fuchs Machinery & Supply, Omaha, Neb.; Harris Frederic & Co., Inc., Shreveport, La.; Machine Tool & Supply Co., Tulsa, Okla.; Hoffman Baumruck Co., Philadelphia, Pa.; Hunker & Dixon, Indianapolis, Indiana; R. Van Patten, South Bend and Elkhart, Indiana; Shively Bros., Inc., Flint, Michigan; Coast Tool Co., Oakland, California; Harvey A. Wolff, Milwaukee, Wisconsin; A. C. Behringer, Inc., Los Angeles, California; S. B. Martin Co., Cleveland, Ohio; Morris Machinery Co., Newark, New Jersey; Paul & Dudley, Glendale, California; John S. Pettit, Madison, Conn.; L. E. Rogers Co., Chicago, Ill.; Scott Special Tools, St. Louis, Mo.; Tool Specialists, Westbury, N. Y.; Arthur Williams, Beaverton, Oregon; Iver J. Esbensen Co., Denver, Colorado; T. M. Welborn Co., Greenville, South Carolina; The L. C. Keir Co., Seattle, Washington; State Sales & Service, Detroit, Michigan; Alexander & Orlick, Ltd., Brantford, Ontario.

CIRCLE INFORM-A-GRAM KEY NO. 7

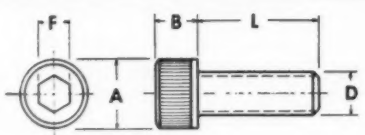
Miniature screws aid standardization of small devices



Standard UNBRAKO miniature socket head cap screws are available in sizes # 0, # 1, # 2 and # 3, in heat treated alloy steel or stainless steel, at your authorized industrial distributor's. Standard lengths range from ⅛ to ½ in.

HEAT-TREATED ALLOY STEEL

Class 3 Fit Standard



	Diameter	Threads per Inch NC	Threads per Inch NF	Length	Recommended Installation Torque in Inch-Pounds NC	Recommended Installation Torque in Inch-Pounds NF	Weight per 1000 in Pounds
#0	A .104		80	⅛		2.0	.152
	B .060		80	3/16		2.0	.182
	D .060		80	¼		2.0	.210
	F .050		80	⅜		2.0	.265
#1	A .118		72	⅛		3.5	.27
	B .073		72	3/16		3.5	.32
	D .073		72	¼		3.5	.37
	F .050		72	⅜		3.5	.47
#2	A .140	56		3/16	6.0		.42
	B .086	56		¼	6.0		.50
	D .086	56		⅜	6.0		.58
	F 1/16	56		½	6.0		.70
#3	A .161	48		3/16	8.5		.59
	B .099	48		¼	8.5		.70
	D .099	48		⅜	8.5		.81
	F 5/64	48		½	8.5		1.03

Tiny close-tolerance Unbrako screws available in standard sizes

New economies in the design of space-saving miniature equipment are possible with these UNBRAKO miniature socket head cap screws. Manufactured to timepiece precision, available locally, they save the costly necessity of designing special screws to fasten tiny parts in compact units. They're ideal for use in typewriters, calculators and computers, servomechanisms, electric and electronic equipment—and in countless other small, intricate devices where maximum reduction in bulk and weight is required with no sacrifice in strength of individual components or assemblies.

Fingers grip the knurled heads on these tiny screws positively for easy handling and fast assembly. Uniform hex sockets assure maximum wrenching torque. Controlled fillets under the heads prevent shearing of the heads. Threads are fully formed for maximum strength and exact fit. Extremely accurate head diameters permit their use in countersunk holes, saving weight by reducing the length of the screw required and making flush designs possible.

These standard UNBRAKO miniature screws are available at your authorized industrial distributor's. See him today. Or write us for Bulletin 2055 and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.

Standard Screws are threaded to the head. Special materials, lengths, and threaded lengths are available. One "High-Titan" UNBRAKO hex key is included with each package of 100 screws.

UNBRAKO®

SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO 3

Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Vastly increased production facilities assure immediate deliveries. Write to the office nearest you, Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

Universal products include:
Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, and Universal Index Plungers. Write for catalog.

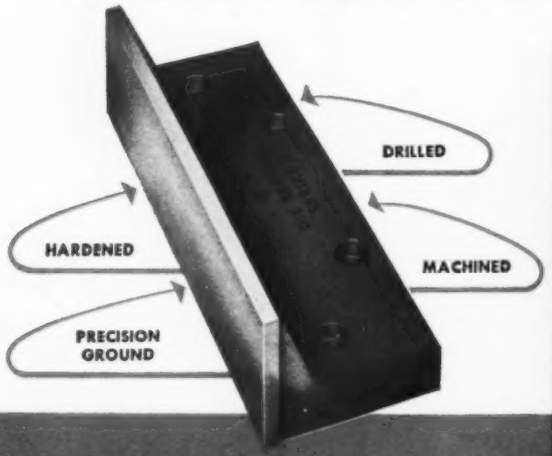
189

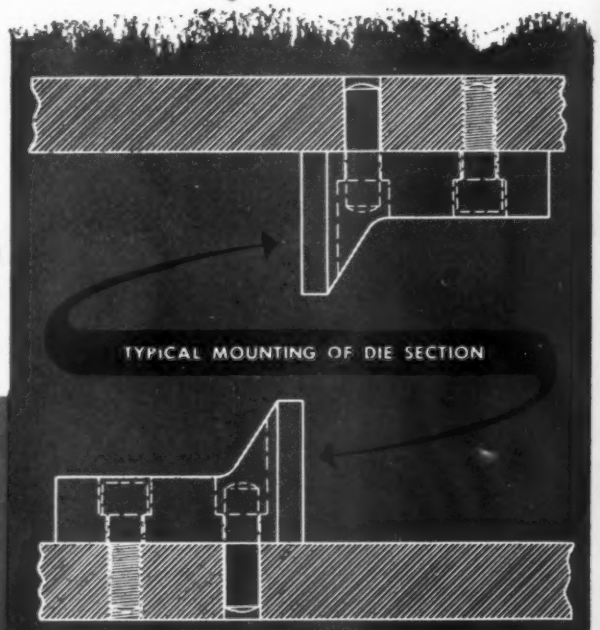
UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 9

Reduce Your Die Building Time...





Standardized Die Sections

Standardized Die Sections manufactured by R-B eliminate all of your machining, drilling, hardening and grinding. For, these die sections are entirely prefabricated and ready for mounting on your die shoes . . . they will substantially reduce your die building time.

Series A, B & C die sections have cutting edges of tool steel which are hardened and precision ground. Bases are of mild steel to permit drilling of dowel pin holes.

Series AA, BB & CC die sections are not hardened, have wider lands and are of the same general construction as series A, B & C. These extra wide lands permit contouring before hardening. Die sections in both series are available in various lengths and heights.

TOOL STANDARDIZATION IS THE BASIS FOR SAVING PRODUCTION TIME. WITH R-B YOU GET THE ACCEPTED STANDARD OF THE SHEET METAL INDUSTRY—IN STANDARD DESIGN FEATURES THAT SAVE IN ENGINEERING, DIE CONSTRUCTION AND OPERATION.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 81 • 12635 BURT RD. • DETROIT 23, MICHIGAN

Please send me additional information.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 10

THIS PROPOSAL CAN SAVE *YOU* REAL *MONEY*

Reports on capital investment savings on the purchase of Portage 4" spindle Horizontal Boring, Drilling and Milling Machines have been as much as 20%. In addition, the initial saving is only part of the story. When you consider operating expense vs. capital investment . . actual dollars saved are even greater than the initial 20%.

It will pay *you*..in more ways than one..to get a proposal from Portage before making a final buying decision.

Write for the Portage No. 4 catalog.

THE Portage MACHINE CO.

1046 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

CIRCLE INFORM-A-GRAM KEY NO. 11

Gardner-Denver . . . Serving the World's Basic Industries

6-spindle Multiple Nut Setter assembles auto flywheel to crankshaft.

A New Keller Tool Fastening Technique Sets New Highs in Assembly Efficiency

Results: reduced costs — control of quality

If you have to set two or more nuts or bolts at a time, you've got a job for Keller Tool Multiple Spindle Nut Setters.

In one simple unit, from 2 to 20 spindles do the work in a fraction of the time required with a single spindle tool.

Designed for extreme flexibility: Standard air motors of any size can be combined in the same tool. Tight bolt clusters . . . different torque requirements . . . bolts at different elevations are adaptations. Handles and suspension can be positioned where desired. Let Keller suggest a setup for you.

Features you can use—profitably!

1. Adjustable torque control on individual spindles. Fourteen sizes cover torque range from 4 to 190 ft.-lb.
2. Torque held to close tolerances—equal to that of accurate hand tools.
3. Easily adapted to changing needs—a new mounting plate does the trick.

GARDNER - DENVER

KELLER TOOL division, Grand Haven, Michigan

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

CIRCLE INFORM-A-GRAM KEY NO. 12

Speed up the job with

ROTOR

ASSEMBLY TOOLS

LIGHT... POWERFUL

a type and size to suit your needs

AIR-POWERED
REVERSIBLE
NON-REVERSIBLE

SCREWDRIVERS · NUTSETTERS
IMPACT WRENCHES · DRILLS

● Write for Bulletin 53 giving specifications on these assembly tools and on the complete line of Rotor Tools for all industry. The ROTOR TOOL Company, Cleveland 32, Ohio.

ROTOR TOOLS
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

CIRCLE INFORM-A-GRAM KEY NO. 13

...for piloted taps from stock

SEE YOUR

Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 14

Every day... *Everywhere*... Your Competitors are using

DEVLIEG
Spiramatic
JIGMILS®

for
ULTRA-PRECISION BORING and MILLING

THE "ACCEPTED" MACHINE FOR JIGLESS PRODUCTION OR ONE-PIECE JOBS

The DeVlieg System of "JIGLESS BORING"— ★ Eliminates expensive jigs ★ Permits complete flexibility of product design ★ Insures interchangeable assembly of parts without hand fitting.

DeVlieg JIGMILS are widely used in toolrooms and experimental shops for machining all types of jigs, fixtures and experimental parts to precise limits of accuracy with a minimum of operator skill.

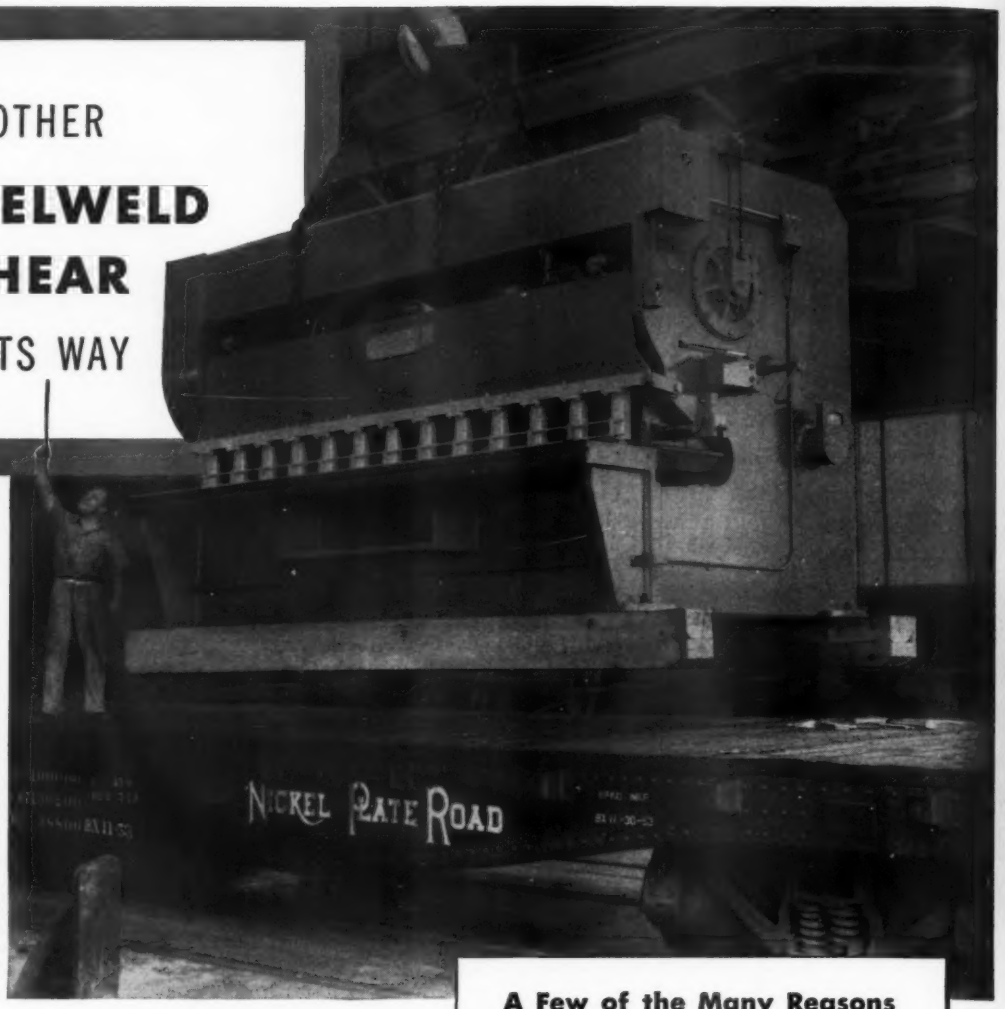
Come to Detroit
SEE A PRACTICAL DEMONSTRATION OF THE JIGMIL TECHNIQUE

DEVLIEG MACHINE COMPANY
Write for Illustrated Catalog

450 Fair Avenue • Ferndale
DETROIT 20, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 15

ANOTHER STEELWELD SHEAR ON ITS WAY



From every angle a Steelweld shear looks good — and is good. This machine is rated for 12'-0"x½"steel

SHIPMENTS are being made at a rapid rate to all parts of the country because more and more users are learning of the many merits of Steelweld Shears and are talking about them. As the words of experience spread about and comparisons are made, more and more people come to realize that Steelweld Shears are really outstanding.

For smooth, accurate burr-free cutting, Steelwelds can't be beat. For ease of operation they have no peer. Their heavy construction and means for simple, easy maintenance assure long trouble-free life.

For the finest in shearing, you can't make a better selection than Steelweld. Say the word and we'll have one of these wonderful machines on the way to you.

A Few of the Many Reasons For STEELWELD'S DEMAND

1. Pivoted-blade operation. Entirely different from every other shear. No slides or guides to wear and cause inaccuracies.
2. Micro-set knife adjustment. Quick easy knife-clearance adjustment for every plate thickness. Something not matched elsewhere. Be sure to get the complete story on this.
3. Mechanical hold-downs. Tight gripping, non-leaking, quiet operating.
4. Accurate easy operating back gauge rides on ball bearings.
5. Cool-operating, long-life, low-inertia clutch and brake.
6. Heavy all-welded rigid one-piece steel frame.

AVAILABLE FOR PLATE LENGTHS TO 24 FEET AND THICKNESSES TO 1½ INCH

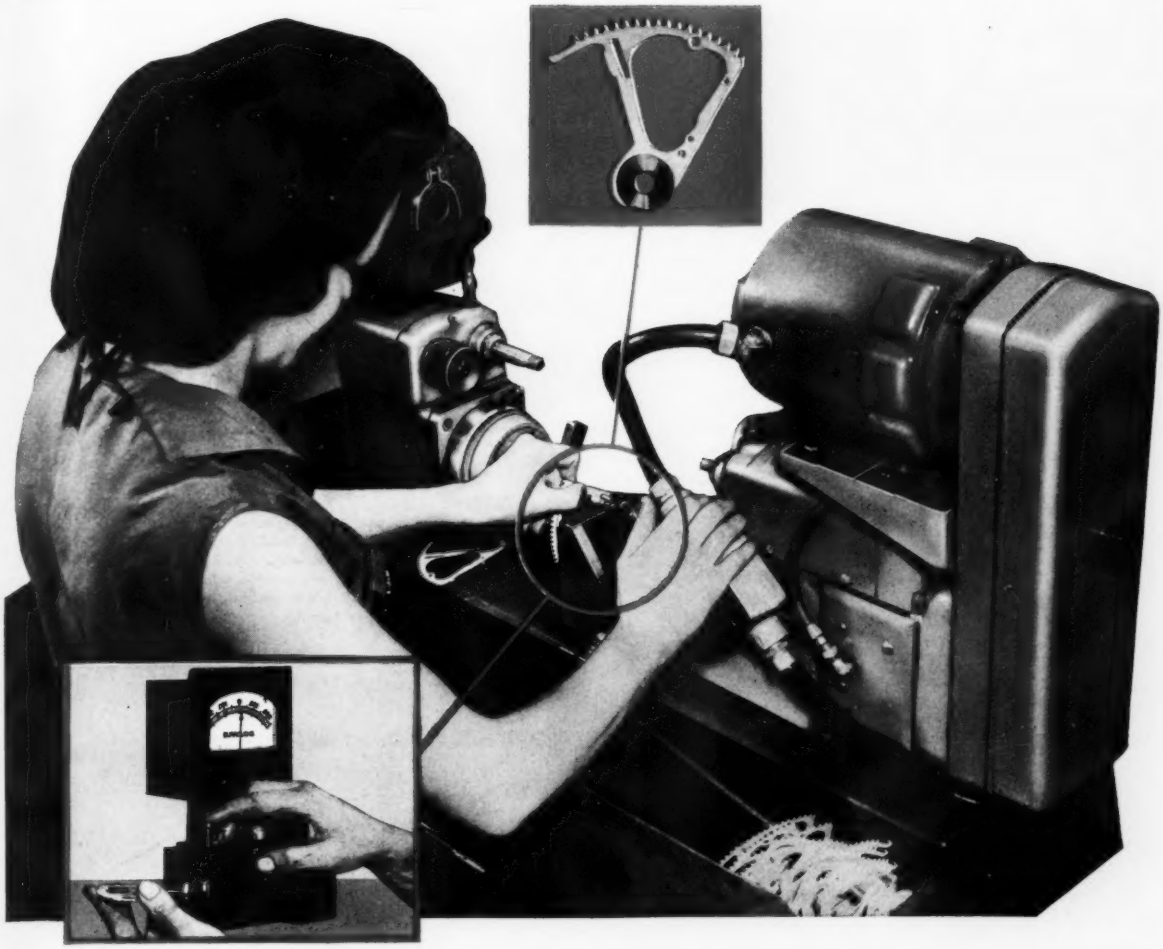
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
8751 E. 282 ST., WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

CIRCLE INFORM-A-GRAM KEY NO. 16



"HARTFORD" Air Hydraulic Drill Units used by Burroughs* to hold precision thickness tolerance

SPOTFACING BOTH SIDES OF A WAFER THIN STEEL GEAR SECTOR TO A THICKNESS TOLERANCE WITHIN .0003" IS ONLY ONE OF THE ADVANTAGES BURROUGHS OBTAINS BY USING HARTFORD DRILL UNITS.

Add up these facts:

1. SPINDLE ACCURACY of units holds parallelism of machined faces.
2. MICROMETER DEPTH CONTROL of Drill Units provides *positive* stop.
3. PRODUCTION DOUBLED over previous method of facing one side at a time. Machining cost cut in half.
4. EXTREME LOW COST of special machine through use of *standard* Hartford components.
5. REJECTS ELIMINATED because the accuracy is *built into the machine.*

*Internationally famous makers of Sensimatic accounting machines.

Another example of better products at lower cost through better methods.

MACHINE TOOL DIVISION K-506
THE HARTFORD SPECIAL MACHINERY CO.
2926 Homestead Avenue Hartford 12, Conn.

☐ Have Field Engineer call.
☐ Send Application Data Sheet and descriptive Bulletin.

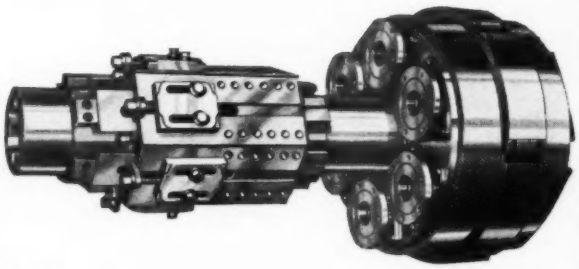
Name_____
Company_____
Street_____
City_____ Zone____ State_____

HARTFORD *Special*

CIRCLE INFORM-A-GRAM KEY NO. 17

CIRCLE INFORM-A-GRAM KEY NO. 16

...ask BAIRD about it



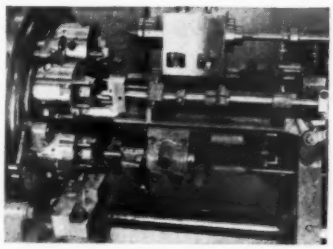
Spindle carrier showing longitudinal bar with individual tool slides, each mounted on hardened and ground ways and bearings and each having micrometer adjustment. Slides at last work station have adjustment for taper turning.

Why the preference for BAIRD Chuckers?

Aside from the fact that the Baird 76-H Chucker has enough outstanding design features and advantages to fill a 12-page brochure (which we will be glad to send you on request), there are two main reasons for its popularity.

One is the unique versatility in tooling provided by an essentially simple, "clean" design which at the same time permits exceptional scope in variety and sequence of operations and cycles . . . including complete automation.

The other is the manner in which Baird Engineering tackles an *individual* customer's problem. Here you get the benefit of our years of work with the nation's top high-production specialists . . . a staff of chucker experts, backed by exceptional tooling and test facilities. When a Baird Chucker reaches the production line, promised performance *can* be achieved . . . and manitained.



An example of versatile Baird 76-H Chucker tooling for finishing a die cast aluminum end plate, single-indexing, including recessing tool for back-facing . . . high speed boring heads, two-spindle lead screw tapping attachment. Production: 420 pieces per hour.

Our case history files almost certainly contain the start of a profitable answer to YOUR problem in high-speed repetitive production. Before you decide on methods or machines, it will pay you to "Ask Baird About It." Write Dept. TP.

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

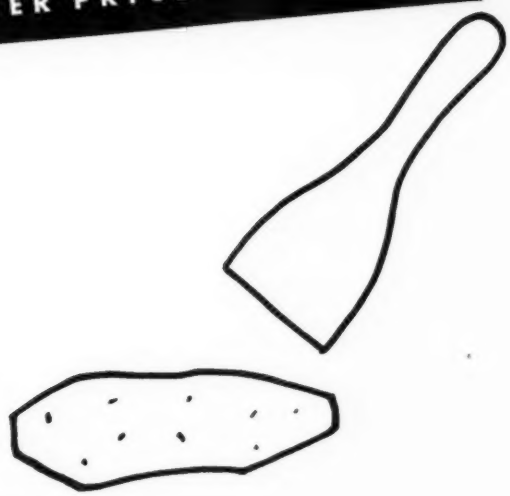
3BA56

CIRCLE INFORM-A-GRAM KEY NO. 18

DROODLES

by ROGER PRICE

J&L



Bench Model BC-7D

Floor Model FC-30

Floor Model FC-14

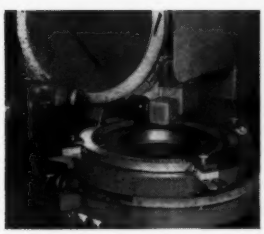
"SWEET POTATO BEING ACCOSTED BY MASHER"

I was going to entitle this stark, dramatic Droodle "Yam in a Jam", but wiser heads prevailed. However, there's no doubt that this sweet young thing (Myrtle, by name) is in difficulty. Here's the inside story. The plug-ugly masher thought Myrtle had been making eyes at him. Not so. She was just looking around for her jacket, which she mislaid while taking French leave from a Greek restaurant. Just goes to show you — *faulty observation causes trouble!*

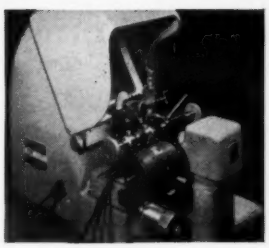
That holds true in industry, too, as 'most any Quality Control engineer will tell you. All of which explains the tremendous popularity of the J&L Optical Comparator. This ingenious device inspects and measures all sorts of parts and objects. It is accurate to .0001", and is extremely flexible in application, enabling you to perform inspections that are not possible by any other method. Eleven models available. For complete information, write Dept. 710 *today*.

JONES & LAMSON OPTICAL COMPARATORS

Precise . . . Rapid . . . Flexible . . . Easy to operate



Critical vane angles in Gas Turbine Shroud Assemblies are inspected and adjusted to tolerance on a J&L 30"-Screen Comparator. Electronic controls for all table motions, combined with sensitivity of optical magnification, make inspection easy, rapid and extremely accurate.



A jeweler's lathe attached to the table of a J&L Comparator makes it possible to turn microscopic parts within the field of the high-powered projection lens. A precision drawing of the contour on a chart determines the shape of the object being turned.

Finding a close angular relationship between the square on the end of this pinion shaft and the gear teeth required a special locating fixture. The square was first nested and clamped in a knife-edge corner, then the gear tooth profile was projected onto the Comparator chart.

JONES & LAMSON

World's Largest Manufacturer of Optical Comparators since 1919

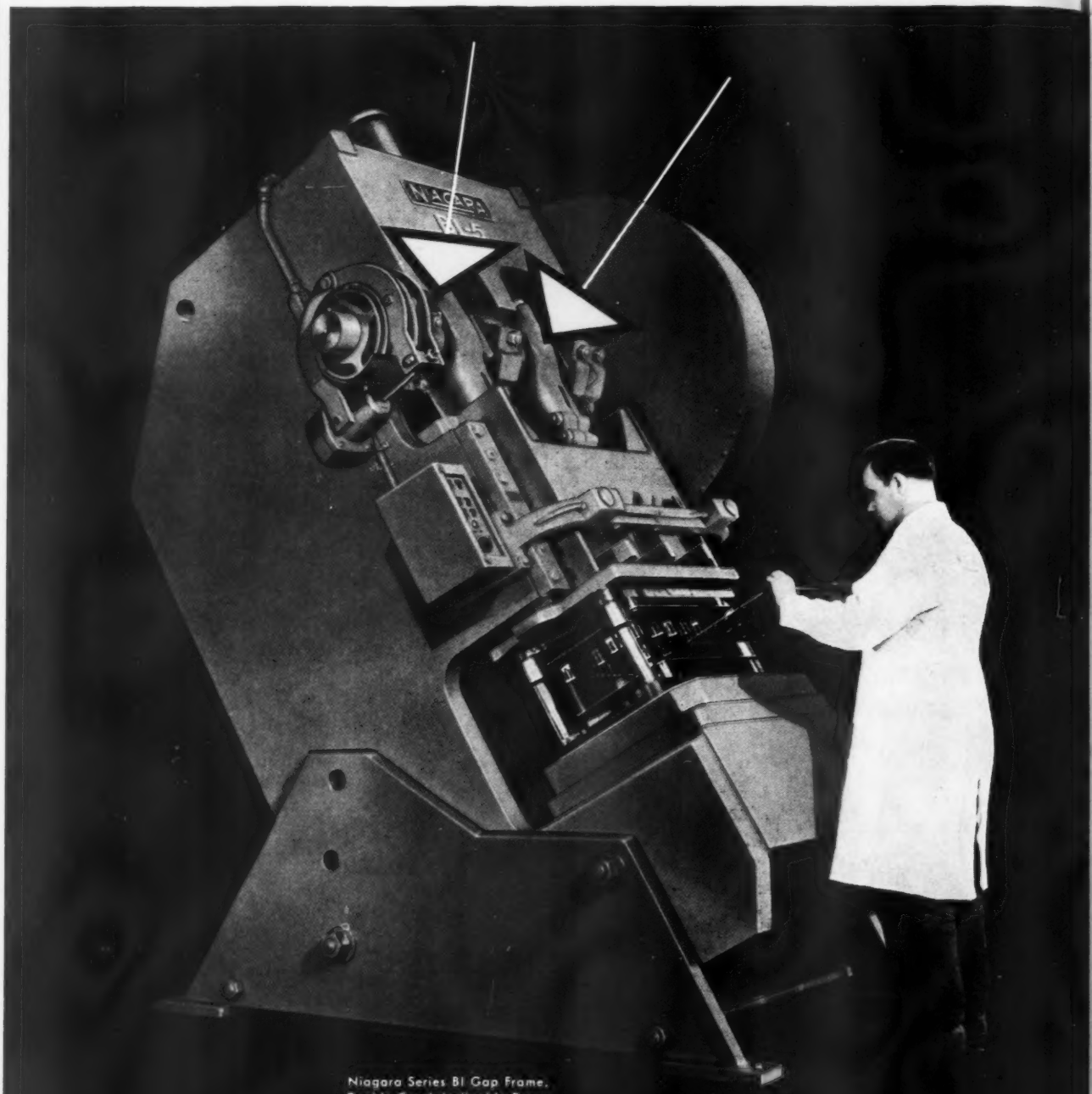
JONES & LAMSON MACHINE COMPANY, 519 Clinton St., Springfield, Vt., U.S.A.

OPTICAL COMPARATOR DIV.

CIRCLE INFORM-A-GRAM KEY NO. 19

NIAGARA 2 POINT I

tomorrow's de



Niagara Series BI Gap Frame, Double Crank Inclinable Press.

Fro
feat
stan
tion
tion

* LON
Nia
off-c
welc
Hea
tion

FAS
Die
side
by
the

GRE
A tr
ing
ing
acco
com

HIG
Opti
driv
quar

MO
Feat
fram
betw
"V"
conn
clut
mini

Star
BI
to l
quir
line
Seri

O
note
ing
engi

NIA
DISTR

Ame

INCLINABLES

design for today's production needs*

From crown to base . . . *taking in every part and operating feature* . . . the Niagara Double Crank Inclinable Press Series stands alone in advanced engineering. By record and by reputation, this is the press with the best future for cost-cutting, production-boosting, *long die area work.*

*** LONGER LIFE FOR LONG DIES**

Niagara's double crank design resists tilting of the slide under off-center loading, thereby reducing misalignment of dies. Rugged, welded steel plate, box type slide rigidly supports punches. Heavy duty, rigid, integrally built frame properly resists deflection, maintaining permanent alignment of bearings and slide.

FASTER WORK HANDLING

Die area is accessible from *all* sides. Work may be fed from either side or front-to-back with equal facility, and is quickly discharged by gravity through the unobstructed opening in the back when the press is inclined . . . *yes, even long work!*

GREATER VERSATILITY

A tremendous variety of blanking, perforating, forming and drawing operations can be performed, with emphasis on work requiring long die areas. All presses in the series are designed to readily accommodate pneumatic die cushions which Niagara furnishes complete with accessories and fittings.

HIGHER PRODUCTION RATE

Optionally equipped with automatic feeds and variable speed drives, Niagara 2-Point Inclinables are well suited to large quantity production and long, continuous runs.

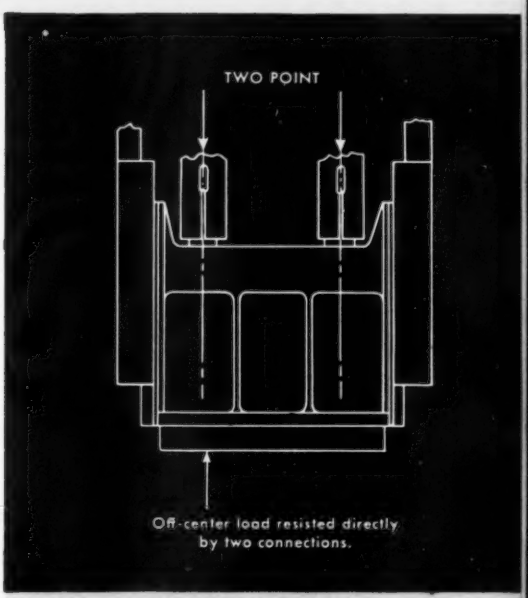
MORE ECONOMICAL MAINTENANCE

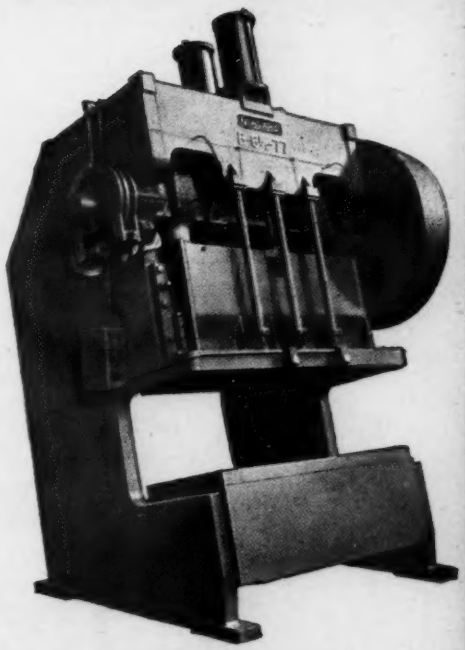
Features that spell *stamina* and *ruggedness* . . . welded steel plate frames with box section crowns and deep beds forming rigid ties between uprights; welded steel plate, box type slides; precision "V"-flat gibs; bronze bushed main bearings; self-aligning ball-seat connections; Niagara electro-pneumatic and mechanical sleeve clutches . . . all combine to keep maintenance at a practical minimum.

• • •

Standardized in capacities from 60 thru 200 tons, Niagara Series BI Double Crank Inclinable Presses are your most logical answer to long die area work. For still longer requirements, Niagara builds a complete line of permanently inclined or upright Series B Presses.

Obtain complete details on *all* the noteworthy Niagara features by requesting Bulletin 65. Consult with a Niagara engineer about *your* problems.





Niagara permanently inclined, gap frame, double crank press.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

Now—"A" Grade Gage Blocks at "B" Grade Prices

Closer Tolerances . . . Superior Finish . . . Longer Life . . . Lower Cost

New Standards for DoALL Gage Blocks

Grade	Tolerance per Inch of Length	Flatness	Parallelism	Surface Finish Microinches RMS
"AAA"	+.000001 −.000001	.000001	.000001	0.09
"AA"	+.000002 −.000002	.000002	.000002	0.09
"A" *	+.000004 −.000002	.000004	.000004	0.09

*Grade B blocks discontinued—replaced by Grade A at comparable prices.

New Literature Free on Request

New Gage Block Catalog and Price List—contains complete data on DoALL rectangular and square block sets . . . and block accessories for assembling fixed and indicating gages for every requirement.

Call or write DoALL for your copy —no obligation.

DoALL has met modern measurement needs with a sweeping change in gage block standards. Grade B blocks (± .000008") have been discontinued . . . replaced by Grade A at an almost identical price! And, Grade A now has a minus .000002" tolerance, formerly minus .000004", providing greater accuracy and a two-millionths cushion for wear.

Grade AA blocks (± .000002") are now priced only slightly higher than former Grade A prices.

For ultra-precision, a new Grade AAA has been established with tolerances of plus or minus one-millionth inch per inch, or less.

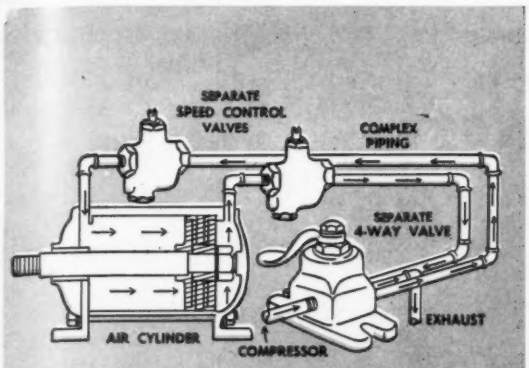
Here is the first basic improvement in overall gage block standards since World War I, when .001" was considered a close tolerance for parts. Here is DoALL's answer to today's needs for gages qualified to check parts to tenths, half-tenths and less. You pay no premium for this needed improvement in accuracy, thanks to DoALL's advanced manufacturing techniques. Remember you get A Grade gage blocks at B Grade prices. Get the facts. Call your local DoALL Store or write:

The DoALL Company

254 N. Laurel Ave., Des Plaines, Illinois

GB-17

CIRCLE INFORM-A-GRAM KEY NO. 22



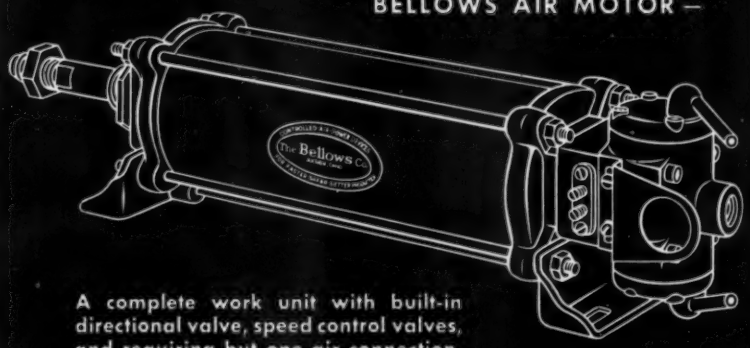
CONVENTIONAL AIR CYLINDER

ONE LOOK

and you can see the

SAVINGS

THE COMPACT, STREAMLINED BELLOWS AIR MOTOR—



A complete work unit with built-in directional valve, speed control valves, and requiring but one air connection.

Design engineers looking for simplicity and economy in air circuit installations will find a quick answer in the two circuits sketched in this ad. One shows a conventional air circuit with separate air cylinder, separate speed control valves, separate directional valve and the piping required to install the circuit. The other shows the Bellows Air Motor—the complete air cylinder package—with directional valve and speed control valves built in, and its single air connection.

But simplification of design and installation problems is actually one of the less important advantages this compact power unit offers. The big advantages are precision control and improved performance. Response is lightning fast; action is smooth and positive. And coupled with improved performance is minimum maintenance —less time out for servicing.

The Bellows Air Motor offers you a choice of *built-in* directional valves: 8v or 110v electrical control, explosion-proof electrical control, manual control, or pilot valve control—in five bore sizes: 1", 1¾", 2½", 3⅝" and 4½", and in any stroke length.

This new four-color, 24-page bulletin gives full technical data on Bellows Air Motors.

It is free on request. Ask for BM-25. Write Dept. TP656, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto.

The Bellows Co.

AKRON 9, OHIO

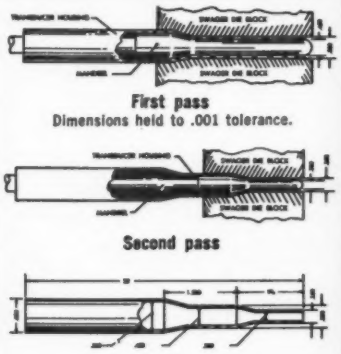
1379A

FIELD ENGINEER OFFICES IN EVERY INDUSTRIAL AREA IN THE UNITED STATES AND CANADA

CIRCLE INFORM-A-GRAM KEY NO. 23

ARE YOU MACHINING **when you should be SWAGING?**

SWAGING TRANSDUCER HOUSING



First pass
Dimensions held to .001 tolerance.

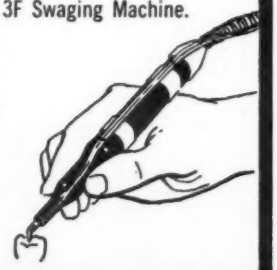
Second pass

Finishing Housing

How SWAGING cuts costs 80% on Transducer Housing

The Cavitron Ultrasonic Dental Unit provides a marvelous new method for preparing cavities without noise, vibration and heat which contribute so greatly to dental pain and discomfort. Internal dimensions of the transducer housing are critical. A mating cap requires the outside diameter to be rigidly held as well. This housing was formerly machined in two parts and silver brazed together. Now, it is made in one piece from tube stock in 2 passes on a Fenn Model 3F Swaging Machine.

RESULT — Cavitron has not only reduced cost of the Transducer Housing 75% to 80% but now has a simplified one-piece housing that is stronger, easier to make and with a smooth, bright surface resulting from swaging which requires no additional finishing. Write for catalog and full information.



FENN

SWAGING
may have important advantages and savings in the manufacture of your products. Fenn engineers are at your service.

Precision Rolling Mills

Turks Heads

Wire Shaping Mills

Swaging Machines

Wire and Tube Drawing Machines

Fenn Manufacturing Company • 202 Fenn Road • Newington, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 24

★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

HONORS: PRECURSORS TO SUCCESS

by Dr. Winston E. Kock
Director
Audio and Video Research
BELL TELEPHONE LABORATORIES
Murray Hill, New Jersey

AMERICAN INDUSTRY IS TODAY facing a serious shortage of college graduates in the fields of science and engineering. This shortage has been brought about in part by the rapid expansion of our industrial facilities and in part by Industry's continued strong participation in the supplying of our defense needs.

An intensive search for college graduates to fill these needs is accordingly now under way, and in this search Industry has incurred the responsibility of ensuring that this new talent will be employed with a maximum effectiveness, so as to maintain a strong industrial America and to create a high standard of living for ourselves and others.

To fulfill this responsibility practically all of our industrial concerns have embarked upon a program of college recruiting which far exceeds in magnitude any such efforts in the past. Each year, for example, in the Bell System, our operating organizations, comprising the associated Bell Telephone Companies, our manufacturing organization, the Western Electric Company, and our research and development establishment, the Bell Telephone Laboratories, jointly send teams of representatives to all of the larger colleges and universities in order to seek out those graduates best suited to fit their needs.

To perform this task effectively, some of the top engineering and scientific talent of these organizations act as recruiting representatives. In this selection of graduate degree candidates, that is, those receiving their Master's or Doctor's degrees, it is especially helpful to have the interviews conducted by scientists or engineers who possess a fairly

A talk given by Dr. Kock at a luncheon sponsored by the honor societies during the University of Cincinnati's observance of the fiftieth anniversary of the founding of its cooperative system of technological education.

FOR MANY JOBS—IN MACHINE TOOLS—ON SURFACE PLATES

Exceptionally Versatile Mounting Holder enables widely varied use.

Hand Movement Always Clockwise, whichever way contact is moved. No reversing latch.

Light Contact Pressure is uniform for both directions of contact point motion.

Unusual Sensitivity gives response to smallest dimensional differences.

WRITE FOR DESCRIPTIVE BULLETIN

MODELS

No. X

Graduated .0001″
Range .008″

Dials Actual Size

No. XB

Both a .0001″ and a .001″ indicator. Change-over by simple substitution of contact point. Dots represent thousandths when using longer contact point.

Regular and Non-Magnetic Models
All Models Light in Weight & Fully Jeweled

STANDARD GAGE COMPANY, INC.

MEASURING INSTRUMENTS FOR PRECISION INDUSTRY

106 PARKER AVE. STANDARD Gages® **POUGHKEEPSIE, N. Y.**

CIRCLE INFORM-A-GRAM KEY NO. 25

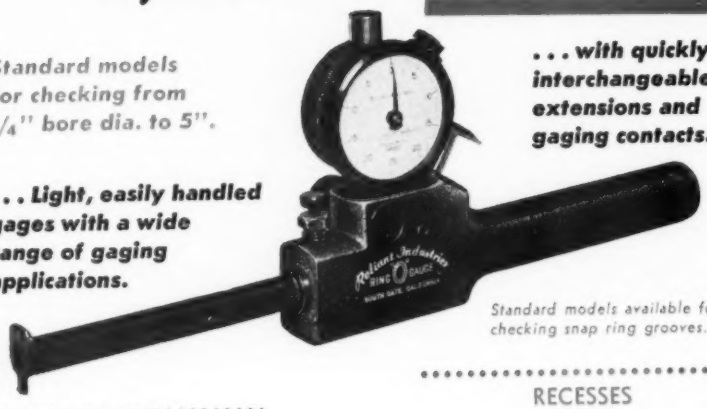
Proven PERFORMANCE.....

...for all GROOVE inspection
"O" RING GROOVES
SNAP RING GROOVES

adjustable GAGES

Standard models for checking from 1/4" bore dia. to 5".

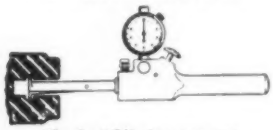
...Light, easily handled gages with a wide range of gaging applications.



...with quickly interchangeable extensions and gaging contacts.

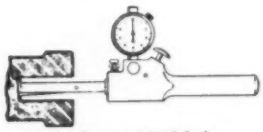
Standard models available for checking snap ring grooves.

"O" RING GROOVES



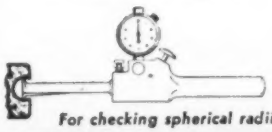
Checks "O" ring grooves.

BLIND HOLES



Checking a blind hole.

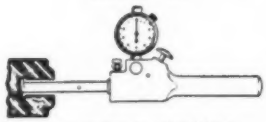
SPHERICAL RADII



For checking spherical radii.

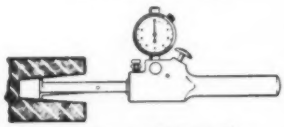
Write for catalog

RECESSES



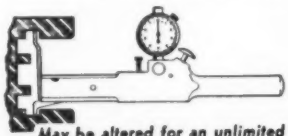
Gaging recess in blind hole.

TAPERED HOLES



Gages taper or bell mouth.

SPECIAL APPLICATIONS



May be altered for an unlimited number of special applications.

RELIANT GAGE & SUPPLY CO.
4947 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA

Reliant Gages
"First Choice of Good Inspectors"

OTHER RELIANT GAGES FOR DIMENSIONAL CONTROL

Gages for Groove Location and Depth.

Tooling Balls and Accessories

Multi-purpose Snap Gages

Special Setting Masters

PRECISION GAGING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 26

intimate knowledge of the field of specialization of the graduate student.

Guides to Successful Recruiting

Now what are the guideposts which Industry can use in its attempt to predict the future success of a college graduate in a particular task? How can we, for example, make sure that the person with a creative mind will be assigned to positions which will fully utilize his talents?

In the past the selection has often been based almost solely upon the graduate's scholastic record. Today a judgment on mental ability alone is not adequate. Two graduates with comparable scholastic records might differ markedly in their personality and ability to get along well with others, and modern Industry and particularly research is becoming more and more a cooperative endeavor.

There still is an important place in research for the ingenious and brilliant scholar who prefers to work alone and who is often referred to as a man with both feet firmly planted in mid-air. However, the great need today is for men who can, through a teamwork effort, draw upon the knowledge and experience of their colleagues in widely different fields. In such team efforts, a personality block, for example, would obviously be a definite drawback.

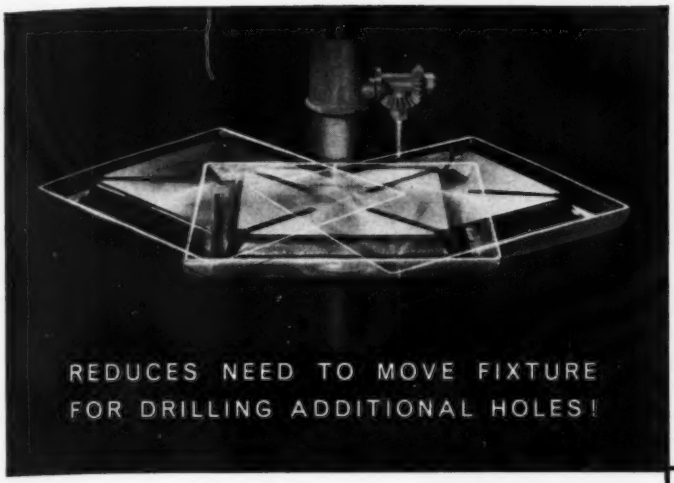
In addition to the student's scholastic record, there is another guidepost which has proved very useful in predicting the future capabilities of a student. It is the appraisal by his professors. The professor knows the student's scholastic capabilities and grades him accordingly, but he also has opinions on some of the other qualities such as his ability to follow through on a particular project, his personal integrity, and his ability to get along with other people.

Industries, therefore, often contact professors either in advance of or subsequent to the interviews of the graduating students. In our Bell Laboratories recruiting, the scientist or engineer who visits a particular college is usually a relatively recent graduate of that college and he therefore knows most of the professors personally. Their frank opinions on each of the students is of great value to us in suggesting areas of employment where the man would have the greatest interest and where he could progress the most rapidly.

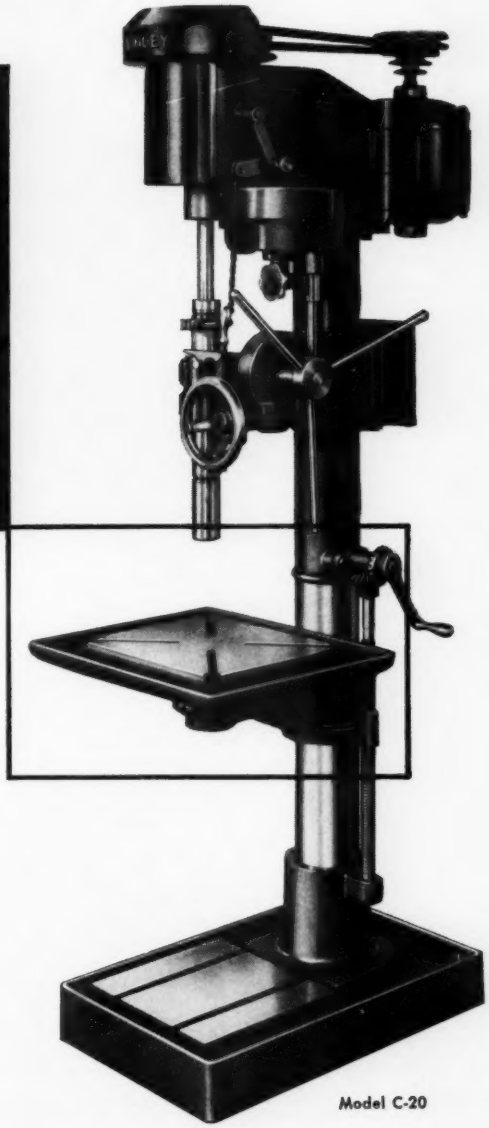
Honors Show Capabilities

A third and very important guidepost in permitting an effective prediction of the graduate's future capabilities can be gained by reviewing the honors and awards which he has received as an undergraduate. I am referring particularly to his election to membership in one or more of the honorary societies such as are represented here.

Sibley Table Swing Saves Set-up Time!



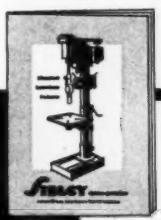
REDUCES NEED TO MOVE FIXTURE FOR DRILLING ADDITIONAL HOLES!



Model C-20

Lick the largest cost item in the toolroom, die shop—or small lot production! Rapid positioning by rotating table arm overcomes need to change set-up.

- **Geared power feeds. Dial selection.**
- **Back gears for extra power.**
- **Drills 1¼" in steel plate.**
- **Accurate. Rugged. Convenient controls.**
- **Sensitive for "feel" of job.**
- **20" swing. 2 h.p. motor.**

Send for  *Free Catalog!*

SIBLEY
MACHINE & FOUNDRY CORP.
SOUTH BEND, INDIANA

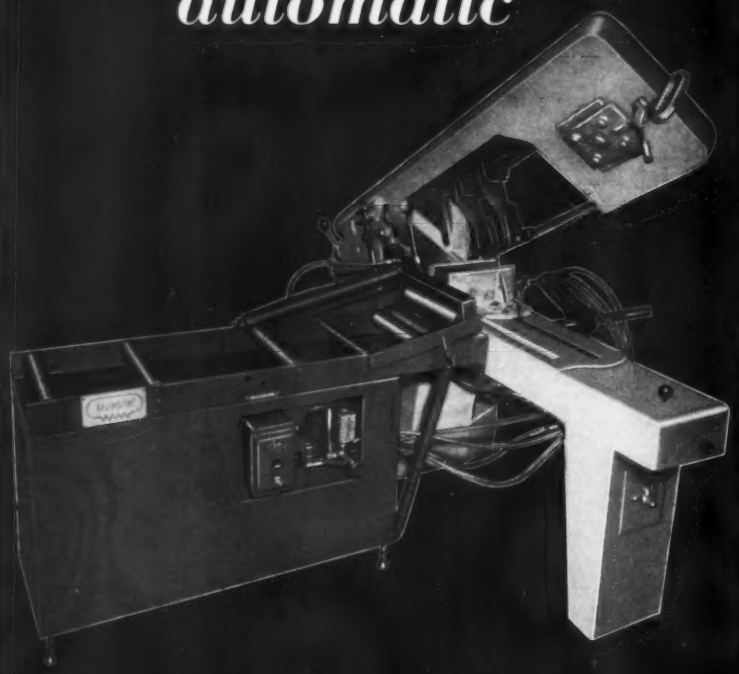
SIBLEY MACHINE & FOUNDRY CORP.
Dept. TP-6, South Bend 23, Indiana
Send Catalog No. 67

Name_____ Title_____
Company_____
Address_____
City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 27

KALAMATIC

... makes sawing automatic



For the labor savings of automatic high production metal sawing, at low cost, write for complete details or contact your local *Kalamazoo* distributor.

MACHINE TOOL DIVISION

Kalamazoo TANK and SILO COMPANY

615 HARRISON STREET . . . KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 28

Such honors constitute a valuable guide because election to membership in most of these honor societies is not based on scholastic records alone. A man must have a good scholastic record in order to be considered for membership, but the additional qualities of leadership, professional interests, activities, and personal integrity are major considerations in his selection.

In our Bell System interview sheets, there is a space for the interviewer to specify his rating of three particular attributes of the candidate. These are, in order, personality, reliability, and mental ability, and a man ranking high in all three in the opinion of the interviewer would be assigned a triple-A rating. The honor societies, in general, have similar rating procedures. There is one big difference, however. The industrial interviewer has only the short time of the interview to appraise the man's personality and reliability. In the selection by an honor society, the man is judged by his fellow students and professors, and they have had long experience in knowing the individual and his particular characteristics and traits. Selection by an honor society implies that the man is respected and esteemed by his fellow students and this mark we find extremely useful in appraising his future leadership potentialities.

One of the honor societies represented here, Eta Kappa Nu, the honorary electrical engineering society, selects each year a man who has been graduated less than 10 years, as an outstanding young electrical engineer. In this selection, great emphasis is placed on factors other than scholastic ability, although, of course, a man's college record is a very important factor. Because the selection is limited to one man per year (usually there are several honorable mention awards), scholastic records would obviously not be adequate as there are many engineers graduating each year with outstanding grades. In this selection, the man's hobbies, his civic contributions, and his extra-curricular activities at college all play an important part. In fact, they are probably the deciding factors in narrowing the choice down to one person.

More Than Scholarship

These broader aspects of a student's character such as personality and breadth of interest achieve their greatest importance many years after the student graduates. The students of today will be our industrial leaders of the future and the problem of management is one that has recently received a great deal of attention by most of our large industrial concerns. The view is held that technical advances either in the development of new forms of consumer goods or in improvements in manufacturing

now...

VALUABLE DIE-SET DATA FOR ALL TOOL ENGINEERS

It's easy-to-look-at! More than 200 pages are specially edited and arranged for quick and simple reference. Full color is used to make tables easier to read, illustrations more clear. The easy-to-look-at format plainly indicates all optional features. Covering the complete Danly "Leadership Line", this catalog presents full dimensional data and specifications for all Danly Die-Sets, Diemakers' Supplies, Bolster Plates and Bolster Plate Accessories. Get your copy of this new easy-to-look-at Danly catalog. *Write for it today.*

EASIER SELECTION—
MORE COMPLETE DESIGN INFORMATION

DANLY

DIE SETS AND
DIEMAKERS' SUPPLIES

WRITE FOR YOUR FREE COPY TODAY!

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Ave., Dept. E, Chicago 50, Ill.

processes provide only one avenue by which Industry can progress.

Many people feel that another important avenue of progress resides in the improvement of human relations and morale in our industrial organizations, and that increases in effective management may yield gain in Industry comparable to the possible technical gains. Early management tended to be too authoritarian, and much of our industrial capacity was limited because of widespread dissatification and low morale. The trend is toward a more democratic form of management, and things such as employee participation and the improvement of communications between the top level management and lower levels are now receiving considerable attention.

All this suggests that the manager of the future will come from those graduates of today who have varied interests, both professional and non-professional, who have good personalities so as to be able to deal with people and talk with people well, and who have qualities of leadership through which they may gain the respect of others. In other words, the same criteria which our honor societies employ in making their selections are those criteria which will be important in enabling the man to climb rapidly the future ladder of success.

Sense of Responsibility

There is another aspect of membership in an honor society which tends to presage future accomplishments of an individual. This is the sense of responsibility and obligation which such membership imbues in the person. One of the societies represented here has the motto "Noblesse Oblige" which as you know originally carried the implication that the nobility, because they were born to their station, carried a lifelong responsibility toward the commoners.

In the case of the honor society, the motto refers to the fact that the person selected is set apart from the rest by virtue of his outstanding character and ability, and he therefore has an obligation to the rest of the world to utilize this ability to the fullest. This sense of responsibility usually spurs the individual on to continued outstanding performance.

In conclusion, may I reiterate the point that Industry, with many problems of expansion still ahead, looks to the honor societies for continued helpful appraisal of college students. Experience in the past has shown that the measures which honor societies use to assess and select their members are the same measures which portend a successful career for the student.

YOUR INFORM-A-GRAM CARD IS ON PAGE 110.1

Big Barrel for better balance, easier reading. Genuine Chrome Clad finish.
Choice of Ratchet Cap, Friction Thimble or direct feel.
Choice of plain or carbide tipped spindle and anvil faces.
One-piece spindle with precision ground threads.
One-piece barrel and frame. Single boring provides exact spindle and anvil alignment.
Exclusive new cam lock optional.
Tapered Compression nut.
Choice of genuine Chrome Clad or slip-proof black crackle frame.
WHY
LUFKIN
Micrometers give longer, more accurate service

1. TROUBLE-FREE DESIGN

Lufkin micrometers combine precision craftsmanship, the finest materials, and constant improvement in engineering. The taper design of the compression nut is just one example of the engineering thought put on every component.

2. EASY ADJUSTMENT

When anvil and spindle faces become worn, adjustment takes only a few minutes and *reading line retains its original position.*

3. WIDE CHOICE OF MODELS

Every personal preference, every job requirement can be met in the complete range of sizes and models in the Lufkin line.

BETTER MEASURE WITH LUFKIN

LUFKIN TAPES · RULES PRECISION TOOLS

THE LUFKIN RULE CO., Saginaw, Mich.
New York City Barrie, Ontario

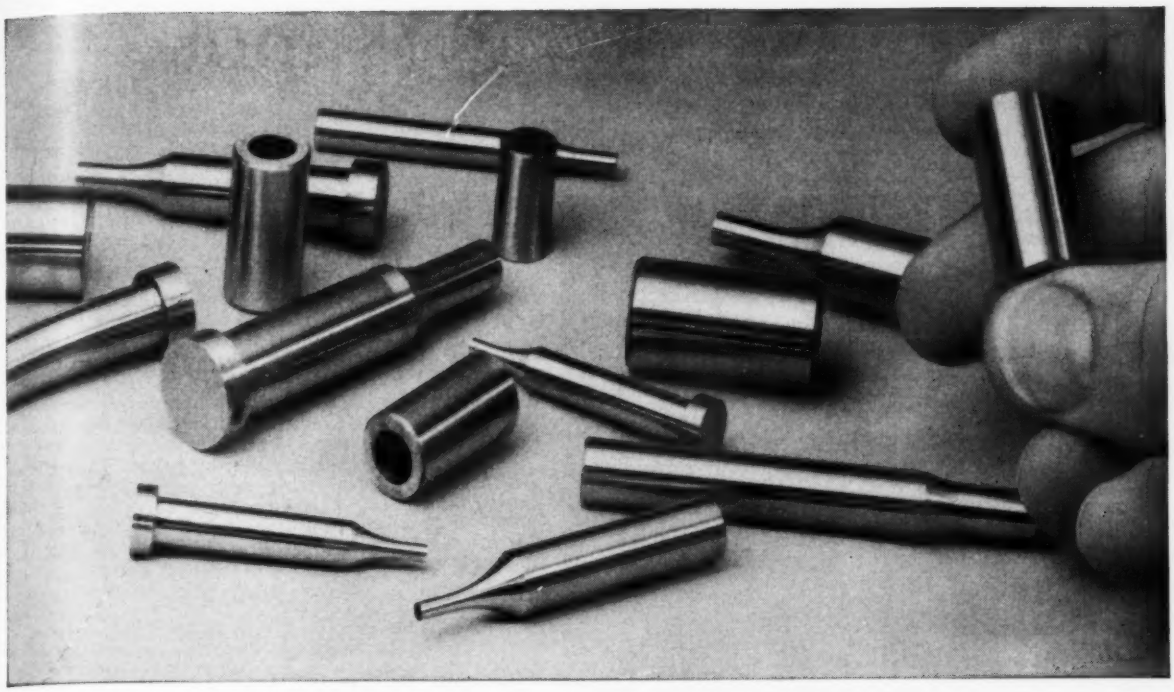
SAVE UNCERTAINTY

CONSULT YOUR INDUSTRIAL DISTRIBUTOR

- He can supply most items immediately from his stock.
- His knowledge of new tools and methods will help you operate at peak efficiency.

417

CIRCLE INFORM-A-GRAM KEY NO. 30



How the country's largest exclusive producer of punches and dies changed complaints to contracts

. . . with Graph-Mo® steel

PORTER Precision Products, Cincinnati, Ohio, is the country's largest exclusive manufacturer of punches and dies—37,000 different sizes in stock. Formerly, Porter produced these products from water-hardening and other high-carbon tool steels, but found that such steels presented distinct disadvantages. For example, they distorted in heat treating, were relatively expensive and difficult to machine, and did not meet customers' demands for longer life.

With a view to correcting these problems, Porter engineers adopted Graph-Mo®—one of four graphitic tool steels developed by the Timken Company—as a standard for the manufacture of punches and die buttons. Because it contains free graphite, Graph-Mo is easier to machine. And punches and dies made of Graph-Mo don't scuff or gall. From every aspect, Porter's adoption of Graph-Mo steel has proved eminently successful.

Graph-Mo outwears ordinary tool steels on an average of three to one. Millions of tiny particles of diamond-hard carbide—one of the most wear-resistant substances known—give Graph-Mo steel longer service life.

Graph-Mo may be the solution to *your* punch and die problems. For more information about all four graphitic steels developed by the Timken Company, and their uses in dies, punches, gages, and machine parts, write for the new Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

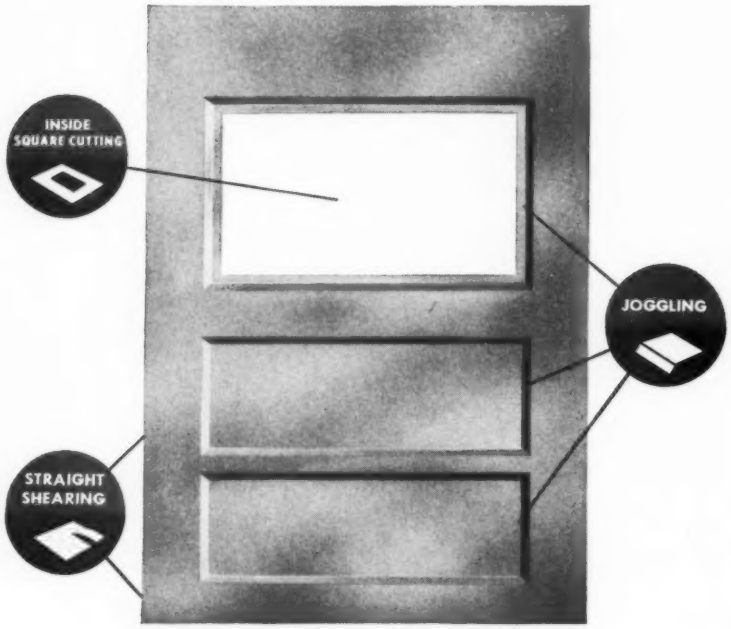
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

CIRCLE INFORM-A-GRAM KEY NO. 31

PULLMAX METALWORKING IDEAS

Expensive dies eliminated with standard Pullmax Tools

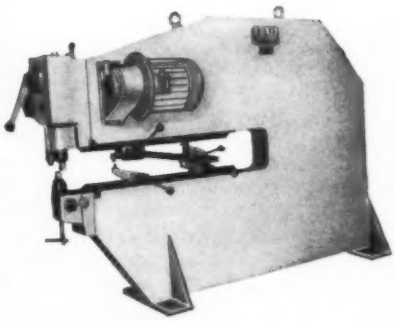


This door panel was made entirely on a PULLMAX

Only the Pullmax universal shearing and forming machine has the versatility to do all of the metalworking jobs in your Model Shop, Engineering or Maintenance Departments.

This one versatile machine does straight shearing, inside or outside circle cutting, design cutting, inside square cutting, beading, joggling, slot cutting, louver cutting, dishing, edge bending and flanging.

7 sizes of machines cut up to 11/12" in mild steel. Ask for a demonstration right in your plant.



AMERICAN PULLMAX CO., INC.
2469 N. Sheffield Ave., Chicago 14, Ill.

MORE MONEY-SAVING METALWORKING IDEAS ARE YOURS IN THIS *FREE* BOOKLET

Please send us the Pullmax Catalog on Money-Saving Metalworking Ideas.

NAME_____

STREET_____

CITY_____ ZONE_____ STATE_____

TITLE_____

CIRCLE INFORM-A-GRAM KEY NO. 32

MECHANISM, by Joseph Stiles Beggs. Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y., 1955. 418 pages, $6.50.

Here is a book that provides the design engineer with reference material for the analysis of mechanism and with a source of mechanical movements. It was written for a course in advance kinematics developed by the author, who feels that practicing engineers also will find the book useful.

It begins by pointing out the dual nature of mechanical design, the choice of a mechanical movement and the design of the machine members, and the fact that these two phases affect each other. Factors affecting the design of members and the design as a whole are discussed. In the second chapter the classical vector equations of relative motion are used to analyze mechanism of varying degrees of complexity.

An analysis of planetary gearing is included, using instant centers, an artifice, and vectors. Subsequent chapters discuss cams, rotary drives, linkages, tension, and flexural links, compression links, fluids, computing mechanisms, and the control of mechanism.

Special topics such as the kinematics of geometrical optics, precision and accuracy, and the combinations in mechanism are also discussed, as well as Newtonian Mechanics of Rigid Bodies, using vector notation.

Added features are a repertory of mechanisms for designers' use, a glossary, bibliography, and appendix, which includes a discussion of inventions and patents.

PLANNING THE FUTURE STRATEGY OF YOUR BUSINESS, edited by Edward C. Bursk and Dan E. Fenn, Jr. Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y., 1956. 357 pages, $4.25.

The most significant, applicable pointers and examples for business managers are presented in this carefully edited digest of the ideas brought forth at last year's National Business Conference of the Harvard Graduate School of Business Administration. Over 1,800 businessmen participated in the conference.

The book can be a valuable tool for businessmen in evaluating the factors affecting the future of their

. . . Continued on Next Page

Electrical Discharge Machining

saved $448 sinking this forging die using BRASS electrodes

Conventional Method

Mill Cavity (Man and Machine)	56 hours
Hand Finish (Experienced die sinker)	52 hours
TOTAL	108 hours

ELOX method

Forge Electrode (Man and machine)	2 hours
Set up and change electrodes (man and machine)	8 hours
Machine hours only (no operator required)	32 hours
Hand finish after E.D.M.	2 hours
TOTAL	44 hours

Saved: 64 hours at $7 per hour

additional EDM advantages in forge die machining:

- Dies are fully heat treated prior to machining thus eliminating possible distortion.
- Resizing forging dies after washout can be done within two hours.
- Inherent workhardening values are retained in the dies since no additional re-heat treating is necessary.
- Actual die life is increased.
- Many forge die alloys are self-polishing after EDM.

This machining application is one of many time and material saving jobs being turned out by the standard Elox M-500 Electronic Machine Tool. See EDM in operation at Elox Demonstration Centers.

*T.M. Reg.

elox

corporation of michigan

1834 Stevenson Hwy.
Royal Oak 3, Mich.

Elox Electron Drills for removing broken taps, drills, etc., from $495 to $3450.

CIRCLE INFORM-A-GRAM KEY NO. 33

Which BUSHING SHOULD YOU USE?

Your choice is getting broader every day. Each of the guide pin bushings above is good—in the right application. But, some of them cost more than others. Which should you use for best results consistent with cost?

That's where Detroit Die Set can help you. In our 25 years of exclusively building die sets, we've tested a good many types of bushings. Based upon these tests and performance in our customers' plants, we stock and recommend a number of types of bushings for use in our die sets.

To aid you in bushing selection, we've prepared a bulletin on the subject. Just ask for Bulletin 56, and we'll send your personal copy without delay. Detroit Die Set representatives also will be glad to personally aid you in selecting the right bushings and die sets. They're as near as your 'phone.

Offices in Principal Industrial Centers

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

companies. A variety of the problems involved in business planning are covered, including finance, control, marketing, communications, labor relations, automation and data processing, and operations research.

Especially interesting are chapters on automation, stressing the impact of labor and small business; an analysis of the Ford labor agreement with the Auto Workers and its implications; and a discussion of the "task force" concept in management teamwork.

Case histories of planning in large and medium-size companies are handled by Ford's Board Chairman Ernest Breech, and Bell & Howell's President Charles Percy and Executive Vice President William Roberts.

INDUSTRIAL STOREKEEPING MANUAL, by Benjamin Melnitsky. Published by Chilton Co., Philadelphia 39, Pa., 1956. 280 pages.

A company's stores department, according to the author, is a plant section whose profit-potential in too many instances has not been exploited to the utmost. Consequently, he presents in each chapter the nature of this potential and shows, through case histories, how progressive firms realize this potential.

He shows how stores department costs can be slashed, how departmental efficiency can be raised, how modern management techniques can be put into use in day-to-day stores operations for greater profits.

The book can be used for daily reference as well as for long-term planning of cost-cutting, efficiency-increasing actions in storerooms, warehouses, and elsewhere in the plant.

Layout for storage areas, material handling, storage means, location systems, receiving standardization, records and forms, stowage, and numerous other similar operations are covered on a practical, dollar-and-cents level in the book.

QUALITY AND COMPETITION, by Lawrence Abbott. Published by Columbia University Press, New York 27, N. Y., 1955. 220 pages, $3.75.

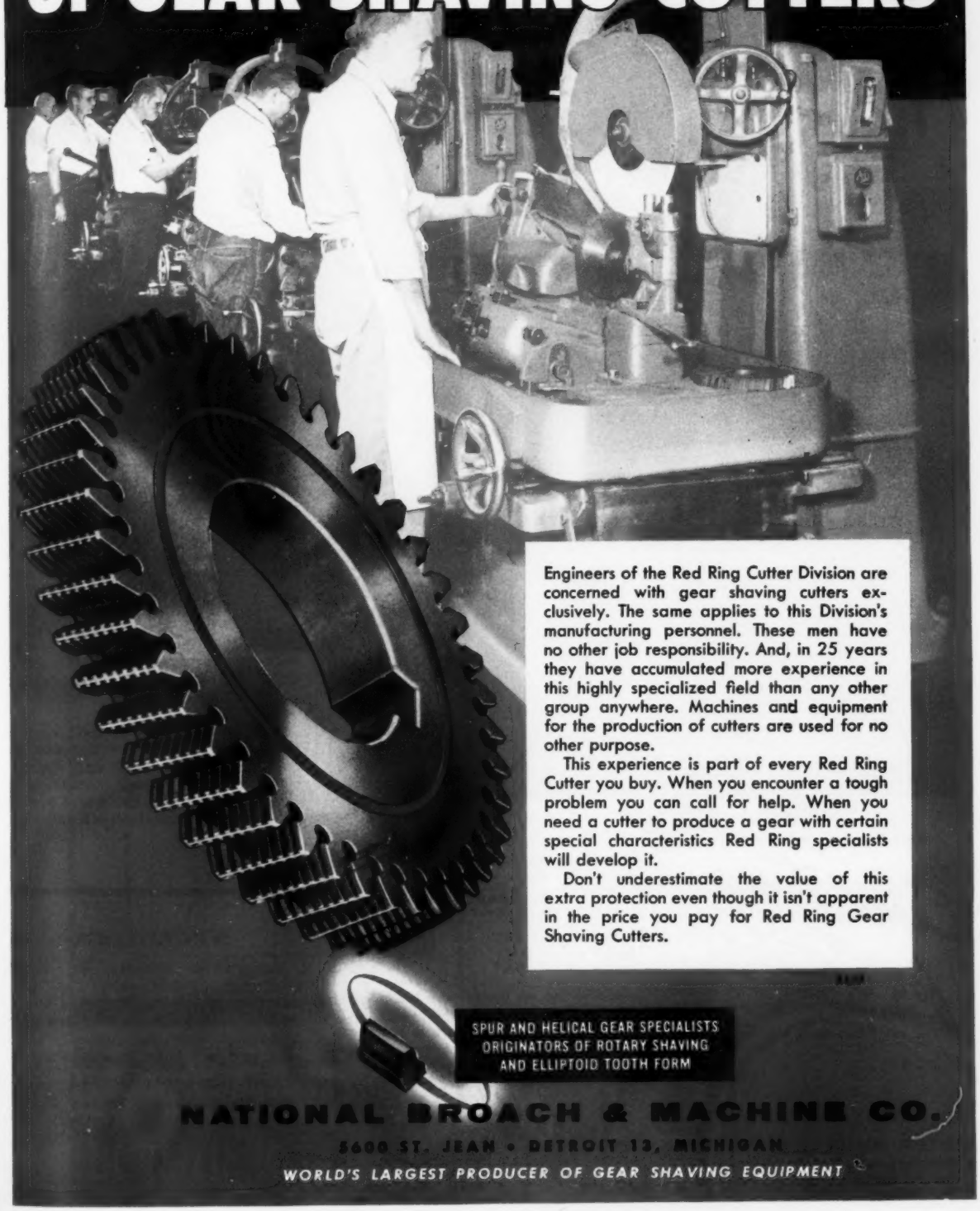
This study of the economics of product quality in competitive markets is based on the theory that a serious gap exists in the structure of economic theory — economists. though thoroughly equipped to deal with problems of price determination, lack the analytical tools needed to cope with problems involving determination of product quality.

In attempting to build a more comprehensive theory of competitive markets, the author develops a theory of quality and integrates it with the contemporary theory of price.

The book begins with an examination of existing economic theory in

. . . *Continued on Next Page*

A Tip to the Buyer of GEAR SHAVING CUTTERS



Engineers of the Red Ring Cutter Division are concerned with gear shaving cutters exclusively. The same applies to this Division's manufacturing personnel. These men have no other job responsibility. And, in 25 years they have accumulated more experience in this highly specialized field than any other group anywhere. Machines and equipment for the production of cutters are used for no other purpose.

This experience is part of every Red Ring Cutter you buy. When you encounter a tough problem you can call for help. When you need a cutter to produce a gear with certain special characteristics Red Ring specialists will develop it.

Don't underestimate the value of this extra protection even though it isn't apparent in the price you pay for Red Ring Gear Shaving Cutters.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 35

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

NOW . . .
AVAILABLE FROM STOCK
Jarvis PIPE TAPS
WITH STANDARD HAND TAP SHANKS!

Here's the answer to the problems presented by conventional pipe taps! Exclusive Jarvis Pipe Taps with standard hand tap shanks easily fit any tapping machine or device—with never a chucking bottleneck. This addition to the dependable Jarvis line of standard taps affords new tapping versatility and precision.

Send Today for Catalog!

Here's the big advantage of Jarvis taps with Standard Hand Tap Shanks—

	¼"—18 N P T Standard Pipe Tap	¼"—18 N P T New Jarvis Pipe Tap
Shank dia.	.5625	.480
Square size	.421	.360
Overall lgth.	2⅞"	3⅛"

Three other sizes are stocked—⅛", ⅜", ½"—and all save man-hours, production dollars.

A Jarvis representative is as near as your phone.

Complete manual with tap data and tips for better tapping is yours for the asking!

Jarvis
CORPORATION
POWER TOOLS FOR INDUSTRY
DEPARTMENT 6
MIDDLETOWN, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 36

which the author rejects the model of the stationary state as being unsuitable for analysis of market behavior in industries where adjustment of product quality can alter the producer's competitive position.

In part two, the author constructs a theory of consumer's choice of quality that rests on two vital assumptions that economic thinkers have neglected: the diversity of people's circumstances and tastes and the imperfections of knowledge of utility. From this is developed an examination of the firm's choice of quality.

Part three establishes a framework in which two dimensions of competition are recognized, quality competition and price competition. Then markets in which both price and quality are free to vary are analyzed.

1956 COLLECTED TECHNICAL PAPERS. Published by the American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich. 524 pages, $4 to ASTE members, $7.50 to non-members.

The ASTE has published its Collected Papers much earlier this year. The leatherette-bound library edition contains in 524 pages, 51 lectures and a panel discussion presented at the recent Annual Convention, two ASTE Research Fund reports, and a preliminary summary of the ASTE Automation Survey.

Coverage includes a diversity of discussions presenting the most recent and complete information available today on such subjects as ceramic tooling, silent sound and electrical discharge machining, automation, electronic calculators, laboratory research in conjunction with production machining, and the training and development of tool engineers.

Included among the lectures is a Shaped Diamond Tool Symposium, co-sponsored by ASTE and Armour Research Foundation, embracing 11 papers presented by world-known authorities in the diamond industry.

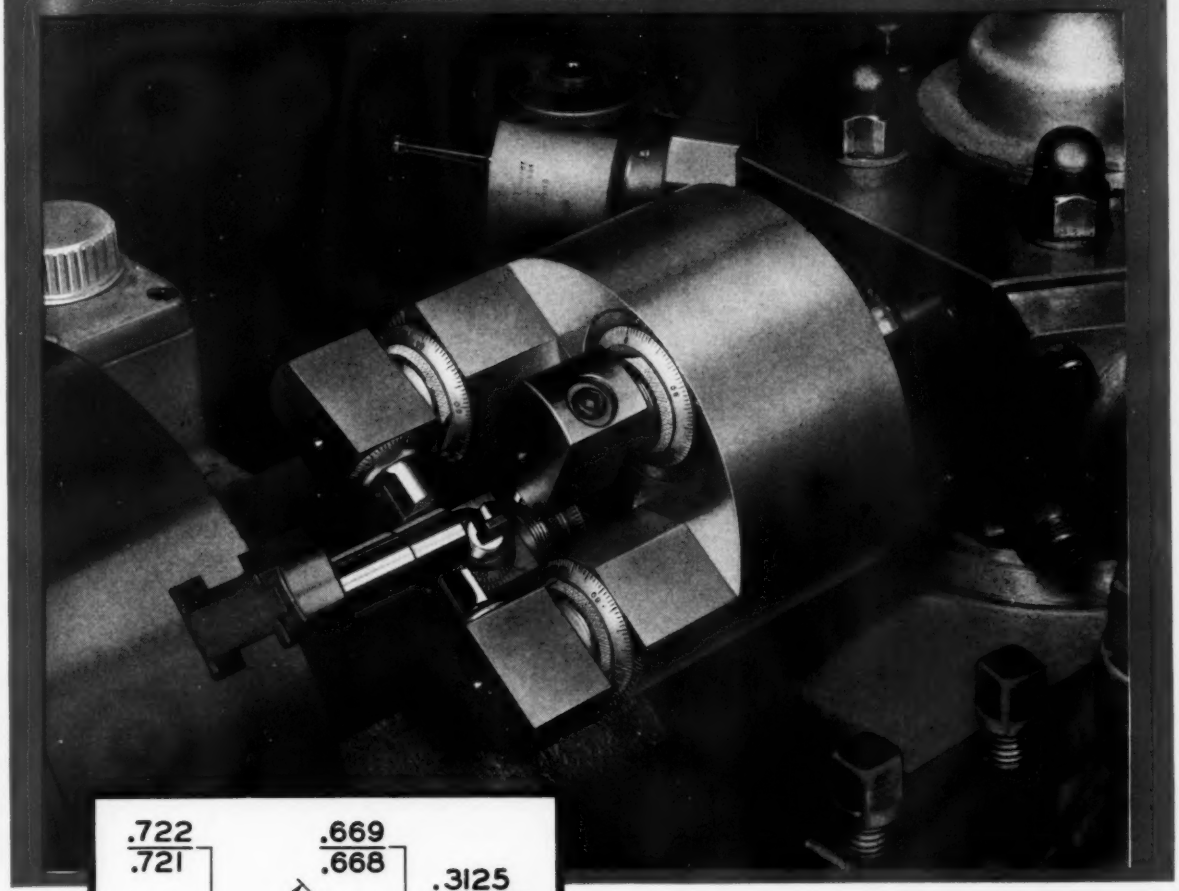
NECROLOGY

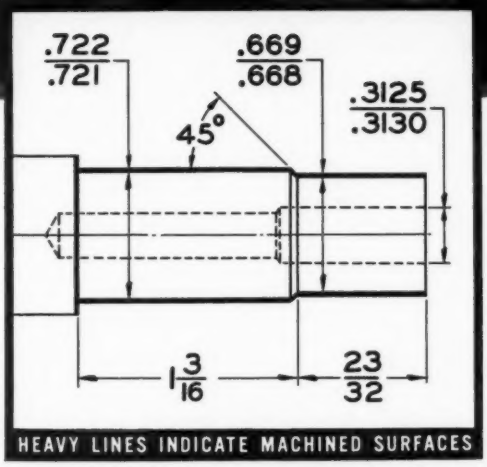
Robert W. Thomas, 65, Board Chairman of McCrosky Tool Corporation, Meadville, Pa., died March 26 after a long illness. He had been associated with the company since 1924 and had been President for 12 years.

Whitfield J. Bell, retired Norton Company abrasive engineer, died April 2 at his home in Baltimore, Md.

Microbore® PRODUCTION TOOLING

FOR PRECISION BORING, TURNING and FACING OPERATIONS





HEAVY LINES INDICATE MACHINED SURFACES

Complete facilities are available for engineering and manufacturing special Microbore equipment for all types of producton operations.

Microbore Reduces Setup and Machining Times on Turret Lathe Operations

Rates of feed on turning operations were increased 100% by incorporating Box Turning Tool with multiple Microbore units.

Opposed Turning Tools are rapidly set for equally divided chip load by means of micrometer vernier adjustment provided at each tool station.

Each tool is adjusted independently by micrometer vernier principle for radial and linear settings which provide accurate and rapid settings of tools for shoulder dimensions and turned diameters.

SEND US YOUR TOOLING PROBLEMS

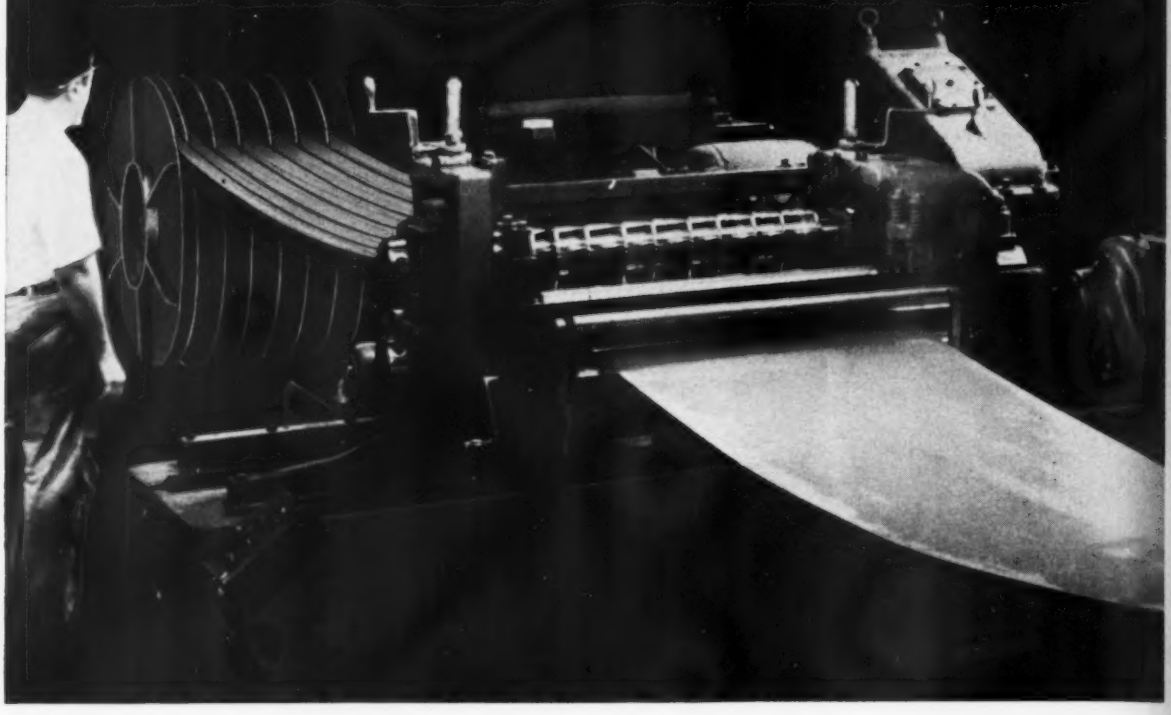
DE VLIEG MICROBORE

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

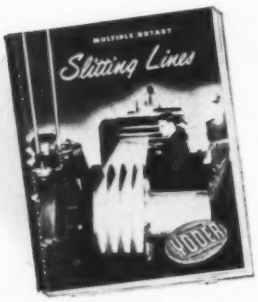
2720 West Fourteen Mile Rd., Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 37

AN EFFICIENT SLITTING LINE



...with big savings possibilities



The Yoder Slitter Book contains time studies, production records, and other valuable data on the economics as well as mechanics of slitter operation. A copy is yours for the asking; also estimates and recommendations.

The standardized series of Yoder Uncoilers, Slitters and Recoilers make possible an infinite number of combinations for highly efficient coil and sheet slitting.

At a substantial saving in first cost, one of these combinations will meet widely varying production needs of fabricating shops as efficiently as higher priced, built-to-order equipment (also designed and built by Yoder) for very big tonnage requirements.

A Yoder standardized slitting line is a most profitable production tool which will pay for itself in short order on strip requirements as low as 100 tons per month, even less. Equally important is the ability in a few hours to meet expected and unexpected needs for slit strands, from a relatively small stock of standard width coils. This greatly reduces strip inventories and simplifies production planning.

THE YODER COMPANY • 5501 Walworth Avenue, Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

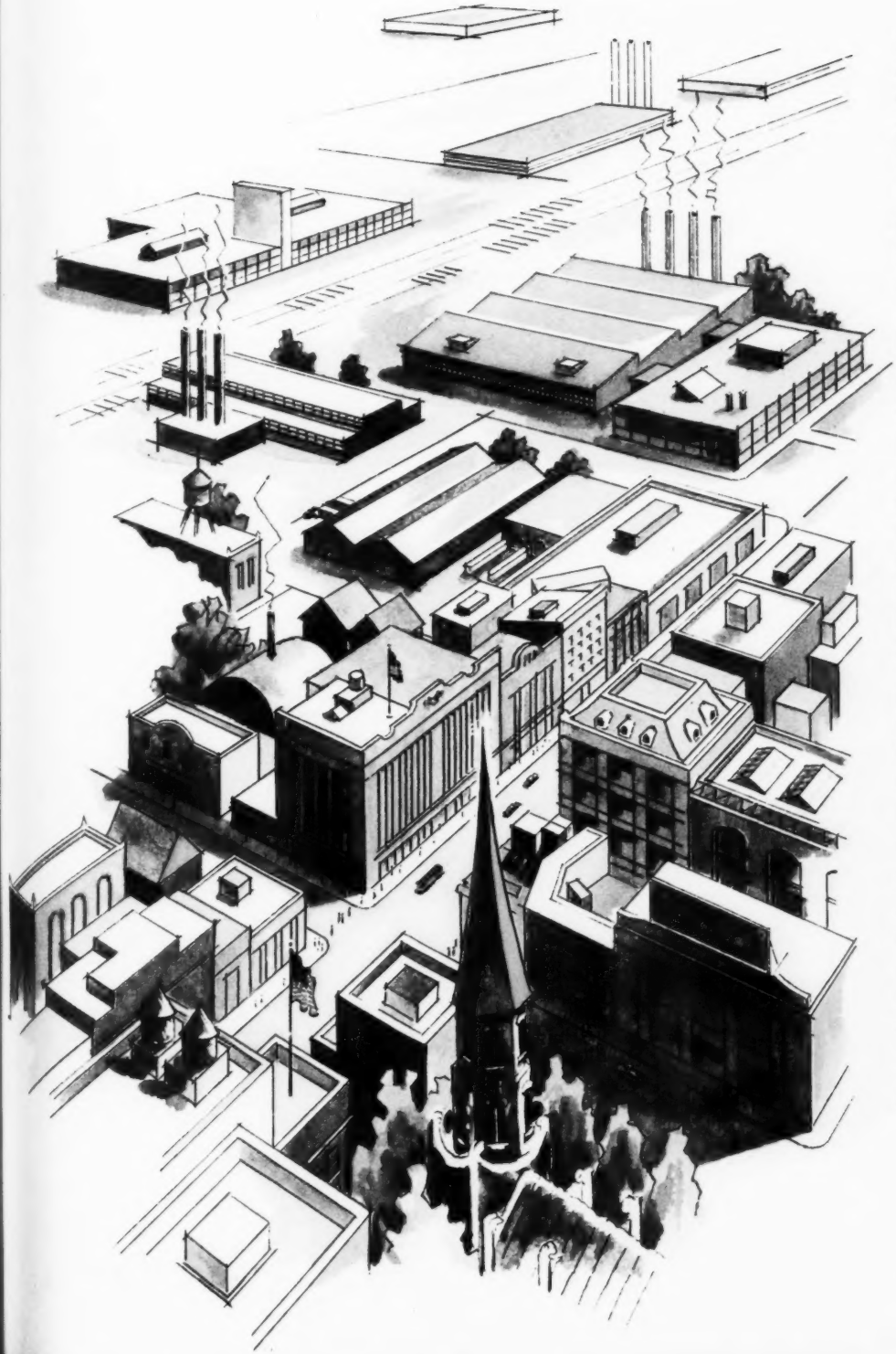
ROTARY SLITTING LINES
COLD ROLL FORMING MACHINES
ELECTRIC-WELD PIPE AND TUBE MILLS

CIRCLE INFORM-A-GRAM KEY NO. 38

ON

YOUR PUTNAM DISTRIBUTOR

Serves Local Industry



We, at Putnam Tool
distributor organizatio
making for 20 years
coast-to-coast, it consis
men, respected memb
make their business a

Our distributors . . . an
form an invaluable li
economic system. Beca
establishments we, as
have throughout the
rooms and local invent
can be sold and quick

Because of the nature
men of diversity . . . h
things. Putnam distrib
with many tools and t
turing processes. Into
salesmen, bookkeeper
labor experts, etc.

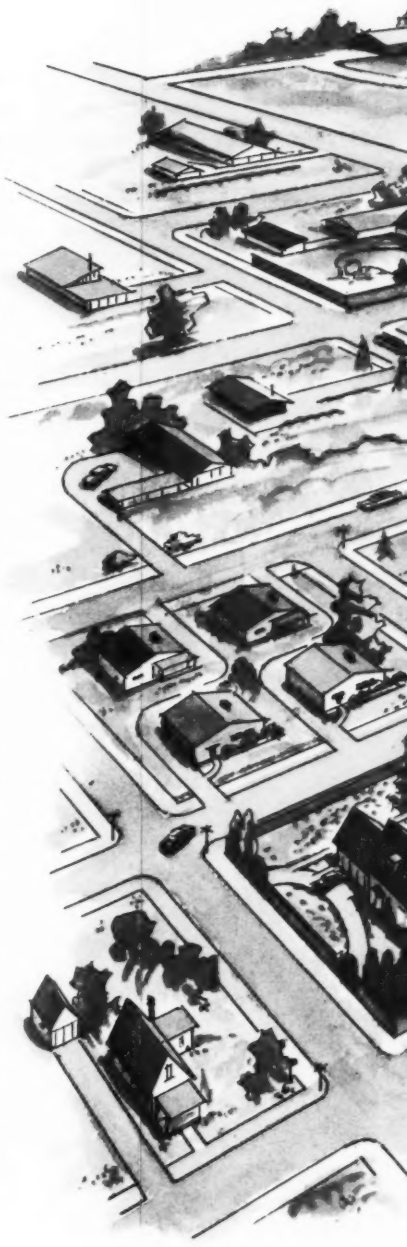
These men and their p
gral part of their com
of labor . . . someti
In either case they are
taxes and services c
munal wealth.

With their roots deep
these men take an acti
distributors are found
in church and school
municipal governments
American . . . solid bus

This is why we, at Putn
a privilege to be asso
express our thanks for

UTOR . . .

ndustry and the Community



We, at Putnam Tool Company, are proud of our distributor organization . . . which has been in the making for 20 years. Strategically located from coast-to-coast, it consists of carefully chosen business men, respected members of their community who make their business a career of service.

Our distributors . . . and countless others like them . . . form an invaluable link in the chain of America's economic system. Because of them and their business establishments we, as a manufacturer of end mills, have throughout the country: warehouses, display rooms and local inventories from which our products can be sold and quickly delivered to industry.

Because of the nature of their business they must be men of diversity . . . have wide knowledge of many things. Putnam distributor personnel are familiar with many tools and their applications in manufacturing processes. Into the bargain they must be salesmen, bookkeepers, market analysts, tax and labor experts, etc.

These men and their places of business are an integral part of their communities. They are employers of labor . . . sometimes large, sometimes small. In either case they are substantial business men whose taxes and services contribute materially to communal wealth.

With their roots deep in their respective communities these men take an active part in civic affairs. Putnam distributors are found on the rosters of service clubs, in church and school activities, and serving with municipal governments. They are in short: thoroughly American . . . solid business men . . . good neighbors.

This is why we, at Putnam Tool Company, consider it a privilege to be associated with these men and to express our thanks for the things they do.

PTC PUTN
TOOL CO M

2981 CHARLEVOIX AVENUE • DE

ty

N A M

O M P A N Y

• DETROIT 7, MICHIGAN

2981 CHARLEVOIX AVENUE • DET

COME WITH US AND
MEET SOME OF THE
IMPORTANT MEMBERS OF
THE PUTNAM FAMILY

OVER 1400 STANDARD TYPES AND SIZES OF PUTNAM HI-SPEED END MILLS

For your convenience and quickest delivery, Putnam catalog lists over 1400 standard types and sizes of highest quality . . . faster cutting . . . longer lasting Hi-Speed end mills. These standard end mills are carried in stock at the factory and by Putnam distributors throughout the country. This means . . . there is a Putnam standard for nearly every milling operation . . . you can select a standard end mill from the catalog today and it can be on your job tomorrow . . . simply call your local Putnam distributor.

PUTNAM RIGID QUALITY CONTROL

Putnam end mills are made by specialists having years of valuable experience . . . machined from high speed steels of rigid analysis . . . produced under a close quality control system that includes individual inspection for a score of important details.

PUTNAM POSTIV-LOK END MILLS

★ *Eliminate Integral Shanks*

★ *Reduce Change-Over Time*

★ *Assure Positive Locking*

5073 LITHO IN U.S.A. 425M

PUTNAM

2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

"Commendable Comments"

"Apprenticeship lays the ground work for leadership in industry and in society."

—Archie A. Pearson, Director of Training, Ford Motor Company, and Member of the Federal Committee on Apprenticeship.

"Many people still seem to think that electronic computers are capable of original thinking and can actually replace skilled labor. This concept of course is wrong. Computers operate on principles of simple logic and can perform fundamental operations at great rates of speed. But they can't think."

—Remarks by J. J. Stone, Assistant Chief Electrical Engineer for Battelle Memorial Institute, at the ASTE Convention.

"The reasons for private industry's neglect of basic research are clear. Pure research cannot be predicted as a profit-making endeavor, and therefore it does not contain elements which allow the ordinary type of management decision."

—Comments by Elisha Gray II, President of Whirlpool-Seger Corp., at the National Industrial Research Conference.

". . . measurement is the scientific key to our modern economy . . . the essential basis of mass production, the essence of which is the fabrication of interchangeable parts — parts which can be produced under measured and controlled conditions so that they remain within allowable limits of dimension and uniformity."

—Dr. Allen V. Astin, Director of the National Bureau of Standards, in a talk at the Eli Whitney Metrology Laboratory, Dayton, Ohio.

"Beyond material welfare . . . business, being the largest creator of wealth, must make its contribution to the cultural and spiritual welfare of the community and nation.

—George N. Jeppson, Chairman of the Board, Norton Company, at a stockholders' meeting.

"It is encouraging to see that many companies are moving ahead rapidly in the support of fundamental research. Whatever the mechanism, the urgent need for a vastly expanded effort must not be overlooked in our planning for the future. Here we have a force in the economy that will not move ahead without vigorous leadership. We must lay no small plans."

—Weldon B. Gibson, Director, Economics Research, Stanford Research Institute, at the Industrial Economics Conference in Los Angeles.

How UNITED AIR LINES Protects Safety Record and Reduces Operating Costs with . . .

3-D Micro-Vision

At the world's largest commercial aircraft maintenance base, in South San Francisco, Bausch & Lomb Stereomicroscopes play an important part in insuring the safety and efficiency of United Air Lines planes. For 15 years inspectors have been using these optical aids for quick, sure identification of defects in cams, bearings, gear teeth, plating, connecting rods, and many other engine parts. Cracks, plating inclusions, rough surfaces which might cause wear—they all show up vividly in natural 3-dimensional detail. These critical inspections, made during regularly scheduled engine overhauls, catch failures *before* they happen. The result: dependable safety,. . . lower operating cost.

FREE! GET THIS EXCLUSIVE 3-D MICRO-VISION BOOK

- See actual stereo views!
- Know *how* and *where* to use Stereomicroscopes!
- Fit exact model to job needs with unique Selector-Chart!

Write TODAY for Manual D-15. Bausch & Lomb Optical Co., 77306 St. Paul St., Rochester 2, N. Y.

BAUSCH & LOMB

SINCE 1853

STEREOMICROSCOPES

America's only complete optical source . . . from glass to finished product

CIRCLE INFORM-A-GRAM KEY NO. 43

HARDINGE
ELMIRA, N.Y.

High Speed Precision
MILLING MACHINES

The RIGHT Size For Work Which is *Too Small for Heavy Duty Millers.*

Advantages

- Saves Production Time
- Higher Speeds
- Lower Power Consumption
- Less Investment
- Saves Floor Space

1 1/16" Cutter Spindle Capacity
with 5C Round Hardinge Collet
Eight Spindle Speeds —
110 to 1850 R.P.M.

Write for Bulletin TM-UM

Model UM Universal Spiral Miller
Model TM Universal Plain Miller

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 44

Acme-FETTE

Cuts threading costs to $0.00003 per piece

On an automotive part that required millions of *duplicate* pieces, one manufacturer found that the application of Acme-Fette thread rolling heads enabled him to:

1. Get required production with 9 Acme-Gridley bar automatics instead of 14.

2. Secure better threading results with rolled threads which provided smoother, tougher threaded pieces.

3. Show a unit threading cost of *3 one-thousandths of a cent.*

4. Reduce total cost per piece more than 33⅓% while producing in excess of 35,000,000 pieces.

Why not check Acme-Fette advantages on your threading jobs?

New Acme-Fette Type N self-opening thread rolling heads are used with either rotating or non-rotating spindles. They let you complete threaded jobs on your present turning equipment without rehandling — roll threads *5 times faster* than thread cutting methods (and with no chip problem).

National Acme

THE NATIONAL ACME COMPANY, 169 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark 2, New Jersey • Chicago 6, Illinois • Detroit 27, Michigan

in DRILLS for FERROUS METALS

To boost your production—have fewer resharpenings—reduce drill breakage—lower costs—Whitman & Barnes manufactures a complete line of drills for ferrous metals. Each drill type is specifically designed to provide highest efficiency when drilling individual metals.

Over 100 years of research, experience and engineering have enabled W & B to provide better drill designs—"There's A Big Difference"—that difference means faster, better and more economical drilling for you. Call your W & B distributor for quality service and the best in drills.

Whitman & Barnes manufactures complete lines of standard drills, reamers, carbide tools, counterbores, countersinks and tool bits, also special tools to your specifications.

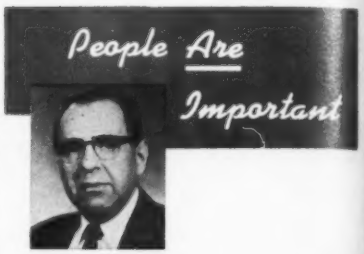
W&B "Makers of Fine Tools Since 1848"

WHITMAN & BARNES

40065 PLYMOUTH ROAD • PLYMOUTH, MICHIGAN

NEW YORK • CHICAGO • LOS ANGELES

CIRCLE INFORM-A-GRAM KEY NO. 46



by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND DEVELOPMENT CORP.
Cleveland 20, Ohio

RULES OF THE GAME

EVERY GAME HAS ITS RULES. This is true of baseball and boxing . . . of badminton and bridge. The players must know and accept them. If they didn't, no game would continue long without confusion and conflict.

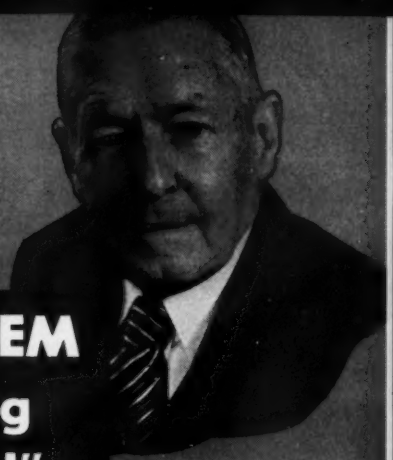
There are two kinds of rules — "general" and "ground". General rules are an inherent part of the game — the ones you cannot change. Ground rules are a matter of choice — special rules to meet temporary or local situations or customs. Three strikes is out . . . three of a kind beat two pair — these are general rules. Deuces wild . . . jacks or better to open — these are ground rules. They must be known and agreed to by all who play the game.

Can you imagine a football game without rules — one in which the officials just made them up as they went along? A touchdown would not be worth six points but whatever the umpire felt like giving it. If he were in a generous mood, he might give it ten or twelve points; if not, only four or five. If he liked one team, he might decide to give them six downs in which to make ten yards. If he disliked them, they might get only three.

Such a game would, of course, be impossible. A team would never know whether to punt or carry the ball . . . whether to try a second forward pass or not. The official's job would be impossible too. It's hard enough to decide what the facts are. Was the backfield in motion? Was the ball carrier out of bounds? Did the guard interfere with the receiving end?

If, in addition to deciding the facts in a situation, the official also needs to decide what to do about them — that is, if he has no rules to go by—it would be practically impossible for him to function — to be fair, effective, consistent, and most of all, to be accepted by the players on both

Dr. Erwin K. Taylor, whose column will be a monthly feature in this publication, is an "industrial psychologist". For a thorough definition of the term, write to The Editors, TOOLING & PRODUCTION, 1975 Lee Rd., Cleveland 18.



"We BID on jobs and GET THEM ... hole punching and notching jobs we couldn't touch before!"

... thanks to our new

WALES FABRICATOR

"Sure, we bid on most every job that comes along. Got a good modern sheet metal department and experienced men too, but we used to miss a lot of good contract stuff. Couldn't understand where or why our bids were off.

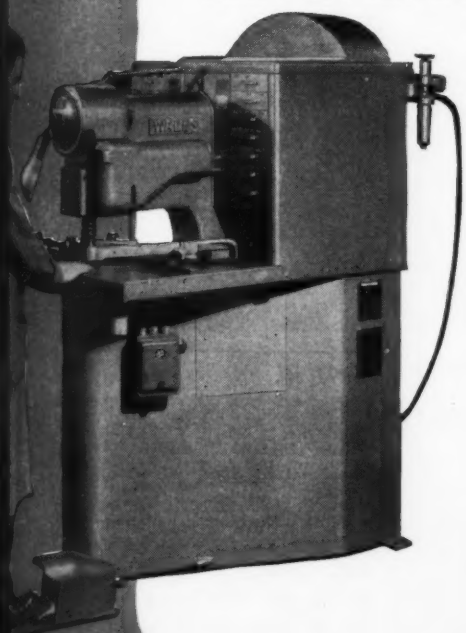
"Trouble was, our estimators, all top men, figured jobs on a past performance basis. Ways and methods used successfully for years.

"We found the answer. WALES FABRICATORS for our punching and notching . . . yes, and nibbling too. 165 strokes a minute! Shaped and round holes are quick to set up and easy to change.

"Set up time is just about one quarter the time it used to take us. Graduated sets of punch assemblies are right at the man's hand. They switch over with little down time and our production rolls ahead. No templets are needed with this equipment . . . think of it! Work right from prints or operation sheets.

"NOW, we get our share of those bid jobs. We make money on them too, even against mighty sharp competition.

"It was a good day when WALES Engineers came in and gave us the answer. They proved it too! The only tough competition for us is another shop with WALES equipment." (It's difficult to beat the 'WALES-WAY'!)



New EASY PAYMENT PLAN

Small down payment and your EXTRA PROFITS will handle the balance in convenient monthly payments. Take several years to pay if you wish.

Send for BULLETIN NO. 11E

Pictures and descriptions that will give you a better idea of the additional work you can handle with the WALES FABRICATOR.

We'll DEMONSTRATE at your door!

Our Mobile Truck Unit will be available to bring the WALES FABRICATOR and other WALES equipment to your door. See it in action. Test its speed and accuracy for yourself. No obligation.

WALES Strippit CORPORATION

"...the Wales-Way is the PLUS-PROFIT way"

345 PAYNE AVE. — North Tonawanda, N.Y.

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

TRADITIONALLY TOPS IN TAPS...

Hanson-Whitney, the established hallmark in the screw thread field of machine tools, cutting tools and precision gages . . . offers **single source** uniformity, dependability and quality.

Hanson's "finished after hardening" process pioneered laboratory precision in commercial tap production. Hanson next engineered thread gages of finest accuracy, establishing Hanson-Whitney precision as the standard of the industry.

Consult Hanson-Whitney on all threading requirements . . . our field engineers can quickly assist in all problems.

Write for further information and literature —

Hanson-Whitney COMPANY

DIVISION OF THE WHITNEY CHAIN COMPANY

172 BARTHOLOMEW AVENUE • HARTFORD 2, CONN.

TAPS • THREAD GAGES • HOBS • CENTERING MACHINES THREAD MILLING MACHINES AND CUTTERS

CIRCLE INFORM-A-GRAM KEY NO. 48

sides. He would always be in trouble.

A shop foreman or supervisor is in the same boat as our unhappy football official unless he has a set of personnel policies — policies that all the workers know about and understand — behind him. Personnel policies are the rules of the game that apply in the work situation.

There are "general" rules — those needed to carry out government regulations and general Industry practice. Some of these are: income tax and social security deductions; time and one-half after 40 hours; workmen's compensation; etc. Then there are the "ground" rules — those required to meet local union contracts . . . policies about matters other than the above. These will vary widely from shop to shop, but they are important everywhere. They cover such topics as: sick leave; promotion policy; safety regulations; coffee break; seniority privileges; etc.

Men, both workers and foremen, need rules to live by. They need to know what's expected of them and what to expect. Supervisors need to know what their authority is and where it ends. These needs are as strong in a five-man shop as in a shop of five thousand.

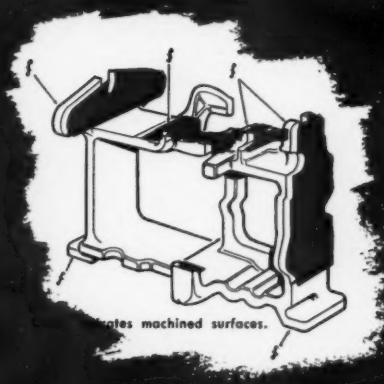
Written — clearly written — personnel policies are a must for every employing organization, big or small. Yet many companies do not have them. If you are one of them, you are in a game in which neither the players nor the officials know the rules.

Good policies, like good rules, should have good reasons for being. Never do something just "because that's the way we have always done it". Find out how it should be done and, if necessary, change policy to agree with present needs. Remember, circumstances change policy to agree with present needs. What may have been good policy ten years ago may be hurting you now.

Every firm, large or small, should have a set of written personnel policies and a plan of formal review of them every year.

A novel kind of shell game is boosting factory production for a Minnesota manufacturer. To remove enamel from hair-thin wires used in electrical coils for thermostats, Minneapolis - Honeywell engineers bombard the coils with finely ground pecan shells and apricot pits. The flying grit does the job faster and more economically than more conventional burnishing methods.

CUSTOMER SPECIFIED

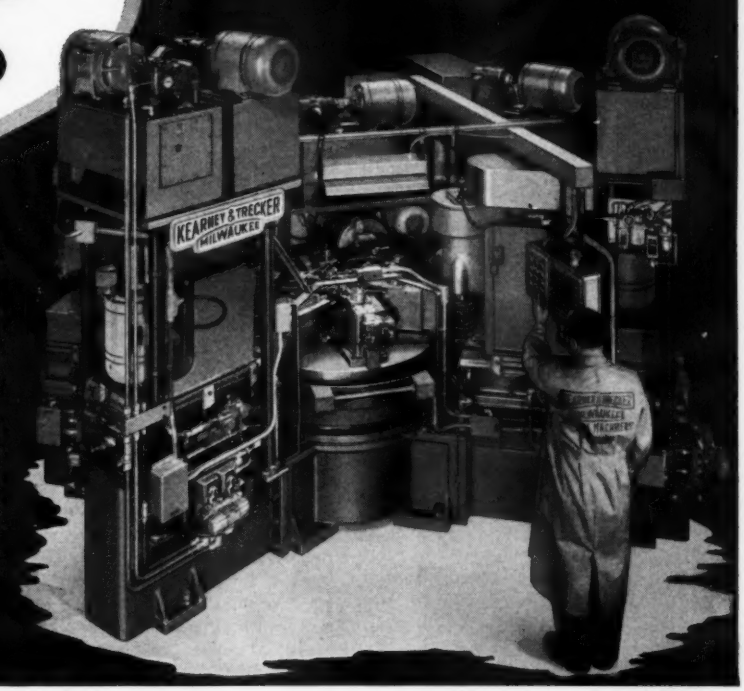


...ates machined surfaces.

KEARNEY & TRECKER MILWAUKEE® DESIGNED

Here's Kearney & Trecker's answer: Two 6-Station Rotary Indexing machines which mill 24 surfaces on cast iron telephone relay frames within plus or minus .002" at a combined rate of 360 pieces per hour. Former methods produced only 150 relay frames per hour.

An important cost-saving feature of each machine is the application of standard units — five feed slides and a 48" rotary index table. Such utilization of standard units lowered initial costs, simplified maintenance and increased efficiency.



High-volume, low-cost production starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines accurately perform many operations at lower cost. But most important to you, this is accomplished by combining standard design components — feed slides, way-type drill units, tapping units, quill feed units, rotary index tables — that keep initial machine costs at a minimum. You get the production you want and the economies you need from job-proven designs. What's more, you get performance to exacting accuracies.

Take advantage of our abilities. See how they can pay off in new profits for you. Whatever your production machine needs, call our representative or write: Special Machinery Division, Kearney & Trecker Corp., 6776 W. National Ave., Milwaukee 14, Wisconsin.

For more information on machine illustrated, ask for Data Sheet No. 1083. A new bulletin, SMD-56, which describes many of our outstanding machine designs, is also yours for the asking.

Designers and Builders of Precision and Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 49

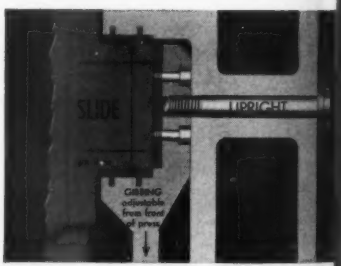
if you manufacture parts *like these...*

A BLISS HIGH PRODUCTION PRESS
may triple your output...or more

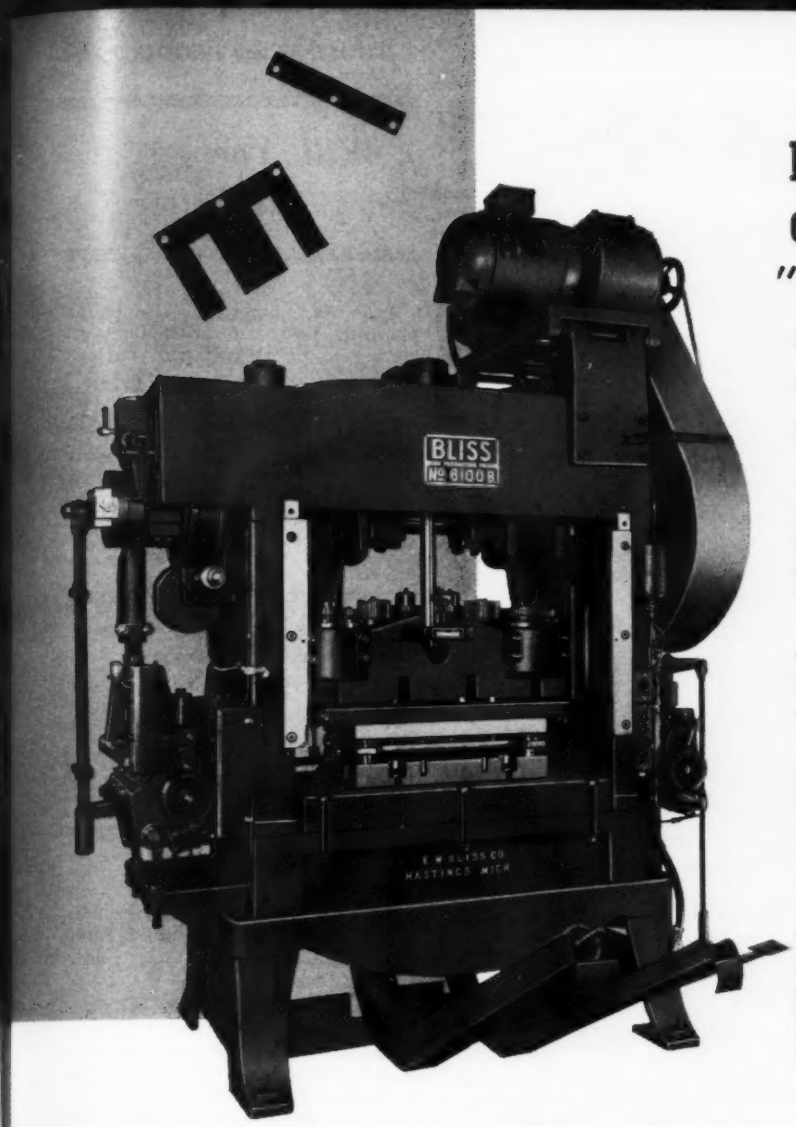
EXCLUSIVE DESIGN FEATURES...assure accuracy at high speed

RUGGED FRAME: The dense, cast Meehanite frame *absorbs sound*, eliminates ringing "ping" at high speeds. Heavy four-piece frame members are keyed and joined by steel tie rods which are "pre-shrunk" to a tension greatly exceeding press capacity. Extra heavy sectioned bed and crown holds deflection to a maximum of 0.001" per foot at press capacity under normal loading conditions. Heavy reinforced crown gives extra support to the shaft. The design of the frame leaves plenty of room for die set up—provides chute space *under* the press.

VARIABLE SPEED DRIVES are standard on H-P presses so that each job can be run at its most efficient speed.



SQUARE GIBS provide precision fit—no more than a 0.0015" feeler goes between gib and slide, although slide moves freely. Location of gibs close to centerline resists tendency of slide to tilt under off-center loads—slide is held parallel to bed within 0.0005" per foot on all dimensions.



Long runs not essential, users report

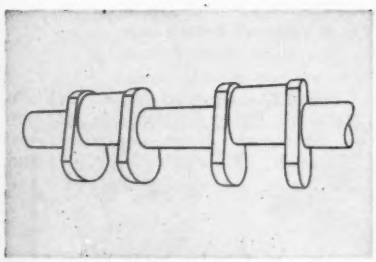
"we set up in 15 minutes, run 3000 parts in another 10..." is typical experience

Consider this: a Bliss H-P Press is usually able to replace from 3 to 12 older and slower presses. And the savings in space, tooling and handling costs alone are often enough to write off the cost of a H-P press.

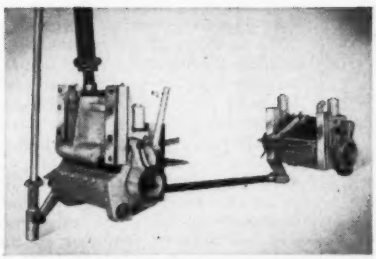
But the really important saving is in the cost of the parts themselves, because you get so many more so much faster and dies last so much longer.

Fast set-up makes that true for both long and short run work. IBM, for example, needs only *eleven* H-P presses to turn out multi-thousand quantities of more than 1500 different parts every three months. Their average set-up time: 48 minutes.

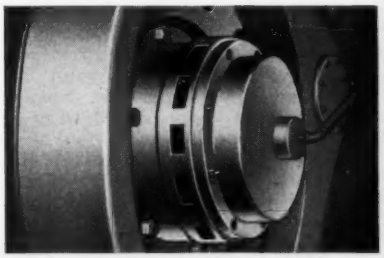
H-P presses are available from 12 to 300 tons, non geared or single geared. Special designs, special feeds extend their use to practically all stamping requirements. We'll be glad to send you complete information by return mail.



COUNTERBALANCED to eliminate vibration. Slide and tools are counterbalanced by means of air cylinder in crown. Where top speed of press requires, the crankshaft is dynamically balanced and the throwblock for the feed is balanced by a compensating weight on the feed adjusting screw.



BLISS FEEDS: Bliss makes its *own* single roll, double roll and special feeds to assure accurate feeding at high speeds. Typical of Bliss design is its roll feed clutch—with *eight* or more rollers bearing on *Stellite* inserts in the hub, it gives greater accuracy *longer*.



AIR FRICTION BRAKE AND CLUTCH: Special design gives die setter and operator complete and accurate control of the press. Air pressure can be set so clutch will slip under severe overloads. In addition, this cool-running clutch automatically adjusts itself for wear.

BLISS
SINCE 1857

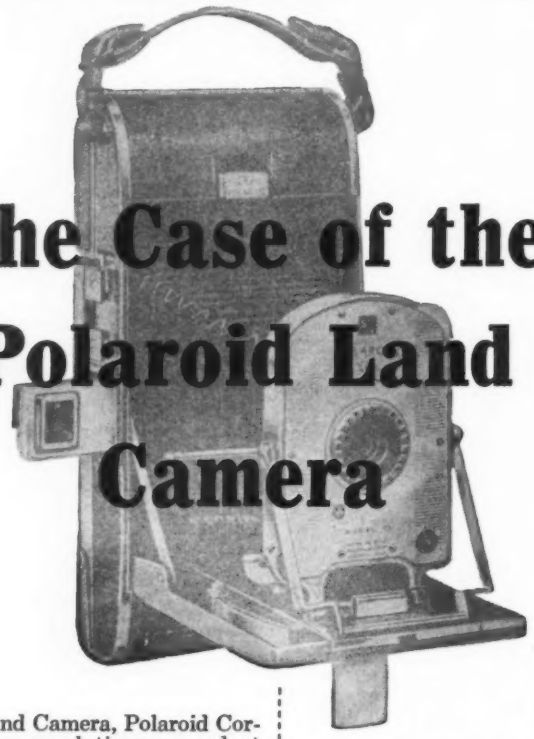
is more than a name...it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; San Jose, California; Midland and Pittsburgh, Pennsylvania. *Branch Offices in* Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Pittsburgh, Rochester, San Jose, Toledo, Washington, D. C., and Toronto, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. *Other representatives throughout the world.*

STAMPINGS IN SMALL LOTS



The Case of the Polaroid Land Camera

In the first Land Camera, Polaroid Corporation had a revolutionary product that took a picture, and 60 seconds later turned out a finished print. Before tooling up for mass production, it had to answer two questions. What is the sales potential? And, will the camera operate perfectly in the hands of the public? Polaroid decided to test the market with a pilot run of 1,000 cameras.

The product engineer, well aware of the value and low cost of short run stampings for such pilot runs, came to Dayton Rogers Manufacturing Company for help. As a result, all die-cut stampings for the first thousand Land Cameras were supplied by Dayton Rogers.

Polaroid was able to test its now famous camera and make changes for a fraction of the price of conventional tooling.

FREE . . . We will gladly send you a booklet describing in detail how Dayton Rogers can take you economically through periods of product development and product change. Please write for it on your letterhead.

LOW-COST WAY TO TEST NEW PRODUCTS

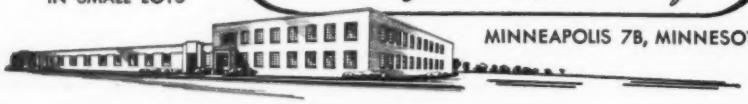
Dayton Rogers Manufacturing Company produces metal stampings in small lots with rigid accuracy and remarkable economy. *The short-run tools cost you no more than 15% to 20% of conventional type tooling.* Here is truly the low-cost way to develop new products and to make improvements or changes in existing products.

This method was originated by Dayton Rogers more than 30 years ago. It is based on a patented process, special machinery and craftsmen specially trained as short run tool makers. No other method equals it. All over the country manufacturers are using Dayton Rogers metal stampings for product research and experimental runs.

Factory-trained representatives in all principal industrial areas

NATIONAL HEADQUARTERS FOR METAL STAMPINGS IN SMALL LOTS

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINNESOTA



CIRCLE INFORM-A-GRAM KEY NO. 52

Will You Be There?

June 3-6. American Gear Manufacturers Association. Annual Meeting. The Homestead, Hot Springs, Va.

•

June 3-8. Society of Automotive Engineers. National Summer Meeting. Chalfonte-Haddon Hotel, Atlantic City, N. J.

•

June 4-7. Special Libraries Association, Metals Division. Convention. Hotel William Penn, Pittsburgh, Pa.

•

June 4-6. Institute of Appliance Manufacturers. Annual Convention and Exhibit. Netherland Plaza Hotel, Cincinnati, Ohio.

•

June 5-8. Materials Handling Institute. Exposition. Public Auditorium, Cleveland, Ohio.

•

June 11-15. Society of the Plastics Industry, Inc. National Plastics Exposition, Conference, and Annual Meeting. New Coliseum and Commodore Hotel, New York City.

•

June 22. Pressed Metal Institute. National Sales Conference for Metal Stampers' Sales Managers and Salesmen. Hotel Carter, Cleveland, Ohio.

•

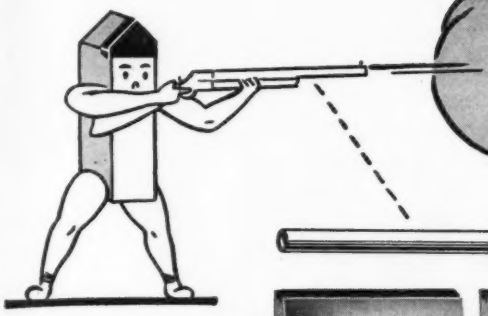
June 22-July 6. International Machine Tool Exhibition 1956. Olympia, London, England.

•

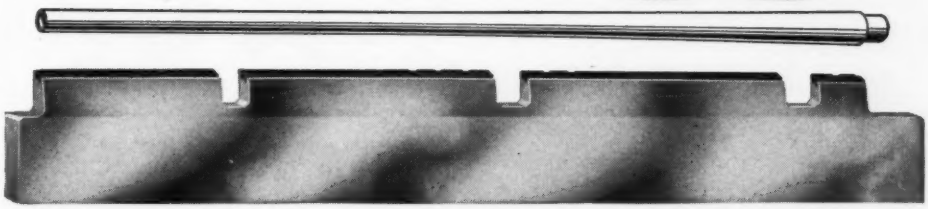
June 25-27. Stanford Research Institute and the University of California. High Temperature Symposium. University of California, Berkeley, Calif.

•

July 16-21. International Organization for Standardization. Council Meeting. Geneva, Switzerland.



50 times more Gun Barrels with Talide® blades . . .



Leading Arms Producer reports outstanding service life with Talide centerless blades over past 10 years—outperforming and outlasting all other work support blades.

Part..... 12 gauge shotgun barrel.

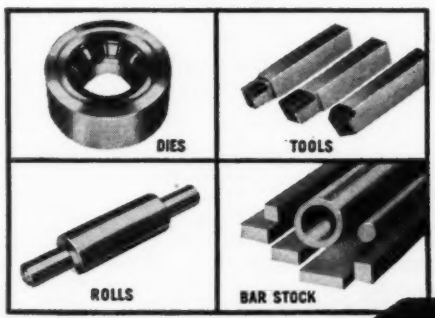
Operation..... Grind entire gun barrel simultaneously to series of compound angles.

Machine..... No. 5 Cincinnati Centerless Grinder.

Blade..... Special Talide-tipped work support blade 34⅜" long, having 9 steps and 10 compound angles ground to .0001" tolerance.

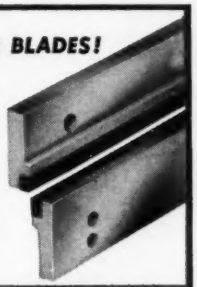
Results..... Talide-tipped blades last 150 days per grind—hardened steel blades 3 days. Several Talide blades have been in continuous production for over 5 years—being retipped with a new Talide metal wear strip every 12 to 18 months.

Tolerance..... Talide blades, due to their negligible wear over long periods of service, enabled the above Arms Producer to maintain the extremely close tolerances required on the above part—and at less cost than possible with any other tooling.



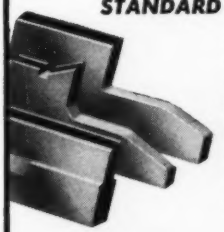
One-piece Talide strip (up to 100" without seams) prevents scoring and scratching. Write for new 84-page Catalog 56-G or ask for sales engineer to call. . . . Metal Carbides Corporation, Youngstown 12, Ohio.

1,000,000 CUTS WITH TALIDE SHEAR BLADES!



A large mid-west electrical equipment manufacturer reports exceptional service life with Talide-tipped shear blades 39" long cutting silicon steel for transformers. Over 1,000,000 cuts are being obtained per blade, compared to 8,000 cuts with a hi-carbon, hi-chrome blade. Burr-free, clean-cut edges produced with scrap rate practically eliminated.

STANDARD OR SPECIAL CENTERLESS BLADES!



Standard Talide-tipped blades are available from stock in over 50 styles and sizes for both Cincinnati and Landis Centerless Grinders and for either infeed or thru-feed work. Special blades to handle parts having steps, tapers or profiles can be made promptly to special order. Blades can be supplied in lengths up to 100" and ground to any tolerance or shape.

4,600 MILES OF SCOTCH TAPE CUT!

A leading producer of scotch tape installed a set of Talide rotary slitter knives 5 years ago on a line cutting scotch tape to size. The original set of knives have, to date, cut 7,000,000 yards of scotch tape with no signs of wear—no resharpening—and no downtime experienced. Officials have decided to equip over 100 shearing machines with Talide knives as a result of the above phenomenal performance.

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 53

ACME DOWEL PINS

ARE NOW SOLD ONLY THROUGH INDUSTRIAL SUPPLY HOUSES

Write for information and prices on micro, standard and tungsten carbide drill jig bushings, dowel pins, chamfer micrometer gages and portable bench centers.

- Sizes from ⅜″ to 6″ in length—⅛″ to 1″ in diameter. Standards and specials, including pins of stainless steel
- Precision pins, hardened and ground to .0002″ or .001″ over nominal diameter—oversized: .002″, .003″, .004″ and .005″
- Acme Pins are case hardened to 60-62 Rockwell "C" scale and core hardened to 36-38
- Acme Pins will break before bending or mushrooming

If your distributor does not yet stock Acme Dowel Pins, please send us his name so we may avail him of a stock. Also ask for Acme Dowel Pin Folder.

ACME

ACME INDUSTRIAL COMPANY

206 North Laflin Street, Chicago 7, Illinois • Phone MOnroe 6-4122

CIRCLE INFORM-A-GRAM KEY NO. 54

SUBLANDS

OFF THE SHELF!

ALL TYPES ...
ALL SIZES ...
ALL SHANKS ...

SUBLAND

- DRILL CHAMFER
- DRILL COUNTERBORE
- DRILL REAMER
- DRILL DRILL

Delivery in Ten Days

WRITE FOR COMPLETE CATALOG

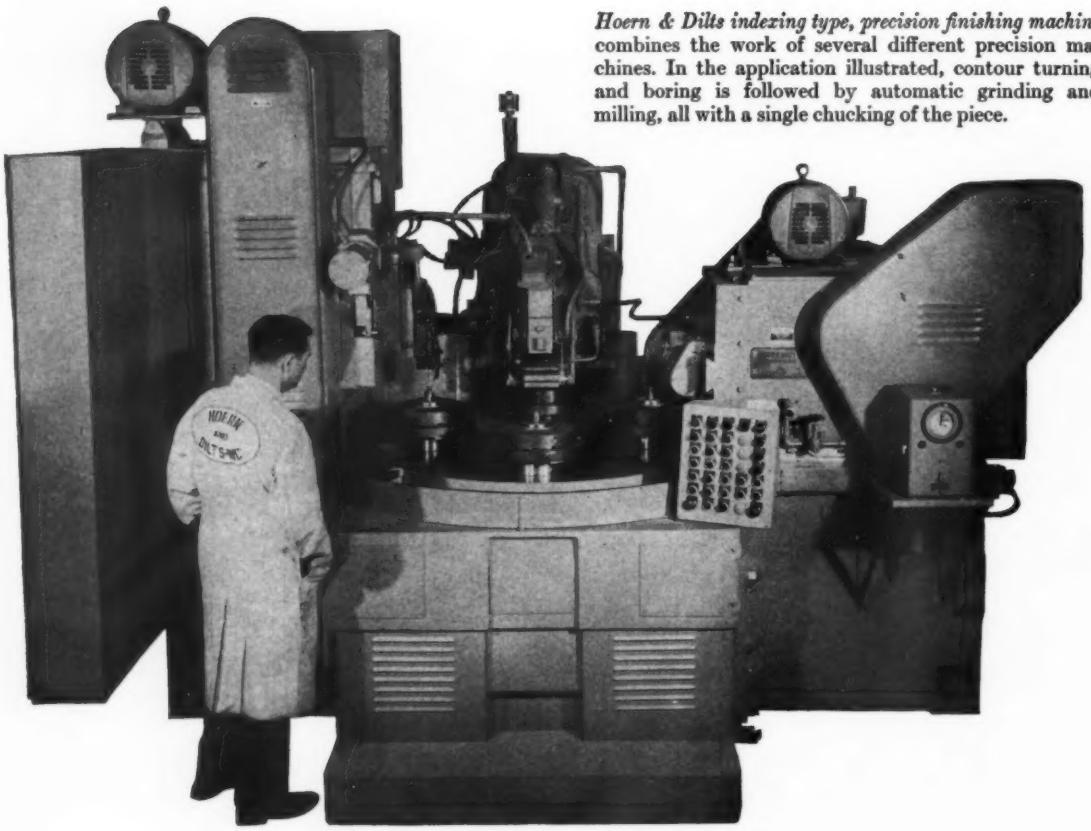
Mohawk
TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

world's largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 55

Hoern & Dilts, Saginaw, Michigan

THE NEW BRITAIN



Hoern & Dilts indexing type, precision finishing machine combines the work of several different precision machines. In the application illustrated, contour turning and boring is followed by automatic grinding and milling, all with a single chucking of the piece.

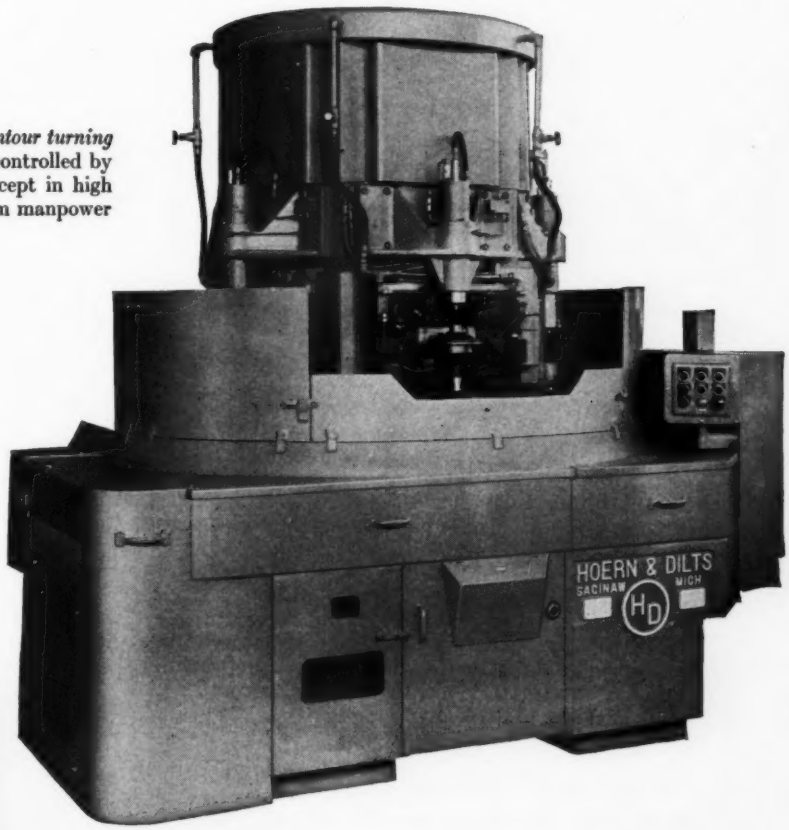
becomes a division of MACHINE COMPANY

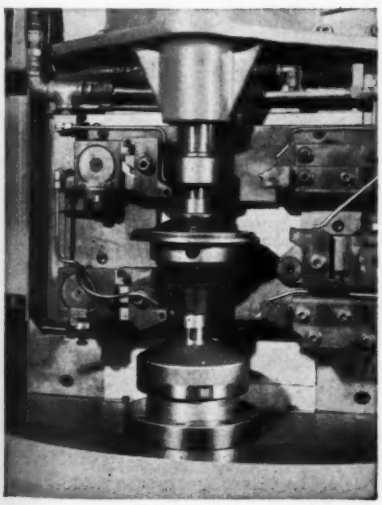
In ten years Hoern & Dilts has become a leader in developing machines for increasing productivity-per-man—by duplicating *the same* operation on five or ten spindle continuous machines, or by performing many *different* operations on multiple column indexing machines.

Now the extensive engineering and manufacturing resources of The New Britain Machine Company are placed at the service of Hoern & Dilts customers.

Write The New Britain Machine Company, Hoern & Dilts Division, Saginaw, Michigan, or consult your New Britain representative for information and literature.

Hoern & Dilts continuous type precision contour turning and boring machine. Five sets of spindles controlled by a single set of cams introduce a new concept in high production of precision pieces . . . maximum manpower utilization without operator fatigue.





HOERN & DILTS
Saginaw, Michigan
A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 57

MANUFACTURING MEMOS

Contests

● Entries in the 1956 Gray Iron Castings Redesign Contest are now being received by the Gray Iron Founders' Society, Inc., Cleveland. This annual contest, in its seventh year, offers awards of $500, $250, and $100 respectively for first, second, and third prizes. The entries will be judged on the basis of ingenuity of design, cost savings, performance advantage, and general applicability.

Cadillac Plastic and Chemical Co. is sponsoring a Design Contest for thermoplastic rod and tube applications. The first prize is $1000 and three second prizes of $150 are being offered, one each in consumer product, industrial or technical product, and architectural or decorative. A parallel contest for students offers a $250 first prize and three second prizes of $75 each.

SAMA President

● Henry F. Dever was re-elected president of the Scientific Apparatus Makers Association. He is president of the Brown Instrument Division of Minneapolis-Honeywell Regulator Co.

Plastic Tooling Research

● The American Society of Tool Engineers Research Fund has initiated an intensive research program on the properties of plastics used for tooling applications. A $10,000 contract has been awarded to the Purdue Research Foundation. The work will be directed by O. D. Lascoe, professor of manufacturing processes in the Department of General Engineering. Co-sponsors of the project include The Bakelite Co., division of Union Carbide and Carbon Corp.; Shell Chemical Corp.; Ciba Co., Inc.; and Marblette Corp.

● Machine tool shipments for 1955 (metal-cutting types only) totaled approximately $670,400,000 as compared with $891,750,000 last year and over one billion dollars in 1953. In the fourth quarter of 1955 the rate of production was substantially higher than that of the previous nine months. This partially reflected sales resulting from the September Machine Tool Show in Chicago. Shipments during the first three months of this year have continued at the same rate as the last three of 1955.

Chrysler Corp. this year will invest more in plant expansion and improvement than in any previous year. The 1956 expenditures for such purposes will be somewhere between $150 and $160-million as compared with $137-million last year.

◆

A constructive program for assistance to teachers in the fields of science and mathematics in the secondary schools has been announced by General Dynamics Corp. In the Rochester area the company has appropriated a $2,000 fund to be administered by its Stromberg-Carlson Division. Five outstanding science and mathematics teachers in the central western zone of New York will receive assistance.

◆

The affiliation of Borg-Warner Corp. and York Corp. has been disclosed. It is part of Borg-Warner's planned program of diversification.

◆

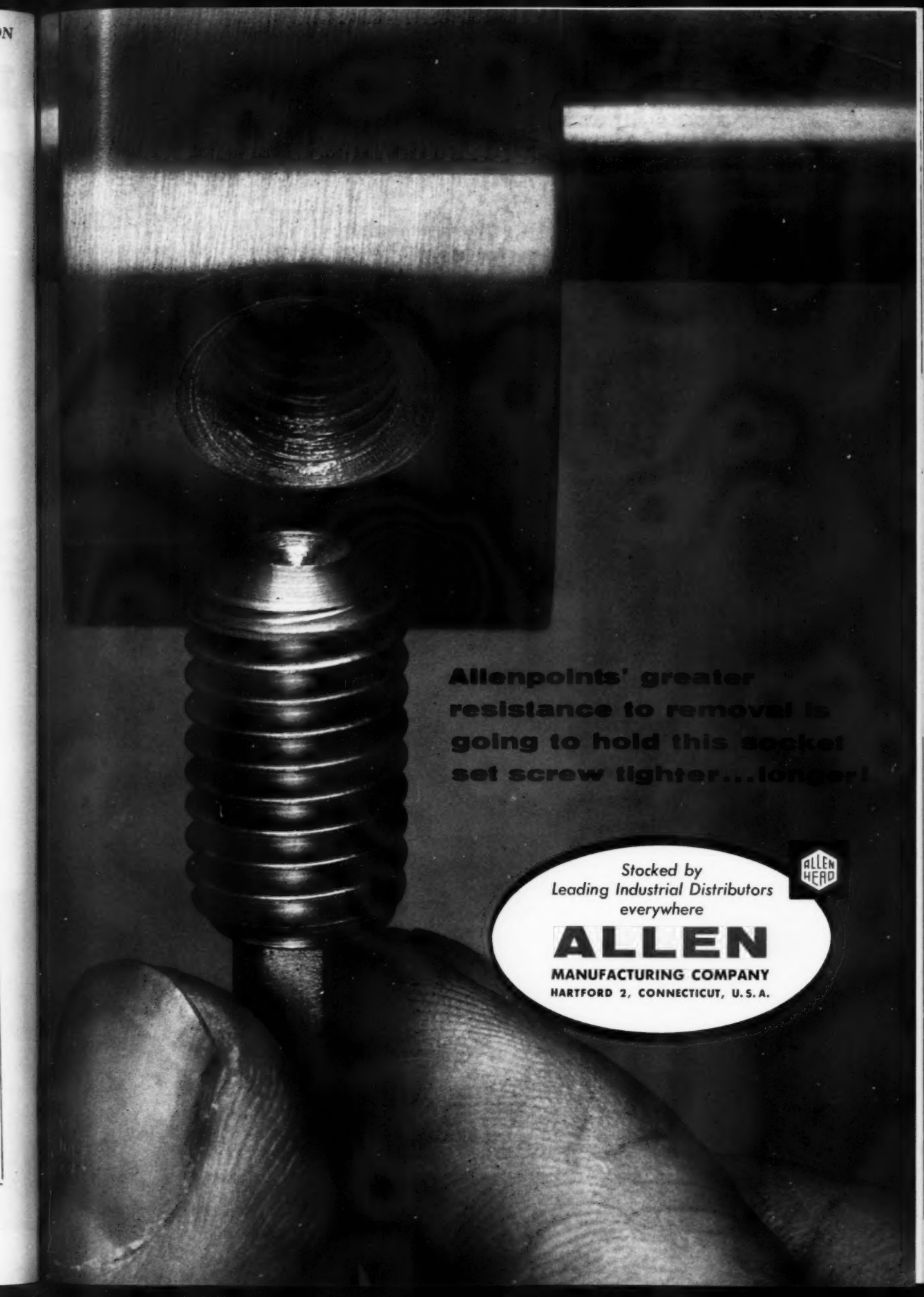
E. W. Bliss Co. has purchased the controlling interest in Matteson Equipment Co., Inc., of Poland, O. The Matteson Co., will be operated as a Bliss subsidiary. Matteson has designed special continuous strip annealing lines and pickling processing lines, and hot dip equipment, as well as other steel mill auxiliary equipment.

◆

The Engineering Society of Detroit's annual award of "An Outstanding Young Engineer for 1956" was presented to Russell R. Noble. He is chief engineer of trucks, Central Engineering Division, Chrysler Corp. The award is made to a young engineer who, the Society feels, is outstanding not only in his job, but in his initiative, background, and "off the job" activities.

◆

The assets and business of Jaquith Carbide Corp. have been bought by Pratt & Whitney Co., Inc., manufacturer of machine tools, cutting tools, and gages. The newly acquired company will be known as the Jaquith Carbide Division. Jaquith produces many types of carbide dies including lamination, wear, header, compacting, punching, and working dies. Pratt & Whitney will enlarge the new division's plant facilities and production program.


Allenpoints' greater resistance to removal is going to hold this socket set screw tighter...longer!
Stocked by Leading Industrial Distributors everywhere
ALLEN
MANUFACTURING COMPANY
HARTFORD 2, CONNECTICUT, U.S.A.
ALLEN HEAD

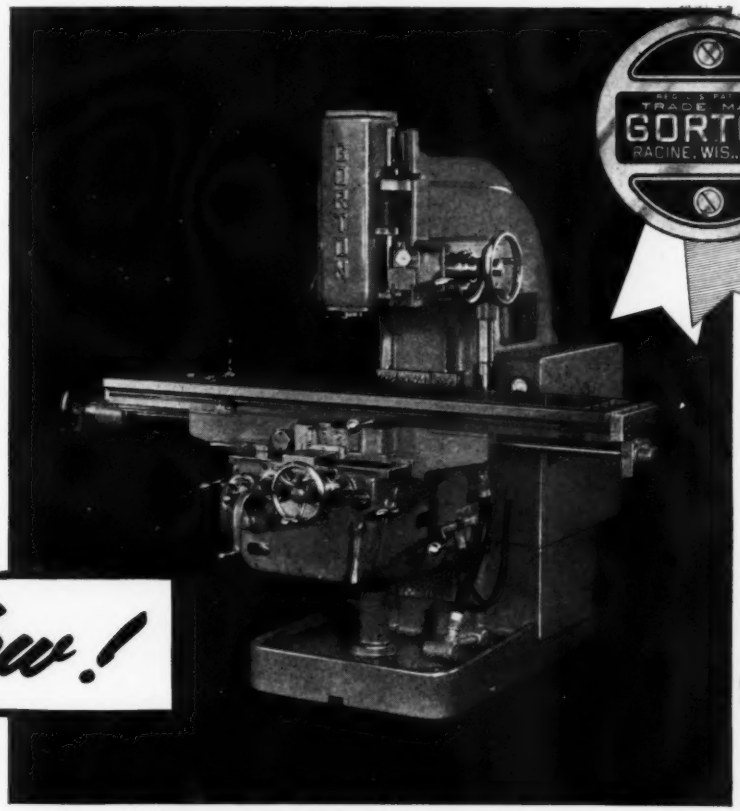
Drill and cut with accuracy . . .

hold with a *Jacobs* CHUCK

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

THE JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONNECTICUT

GORTON PRESENTS A *Winner!*



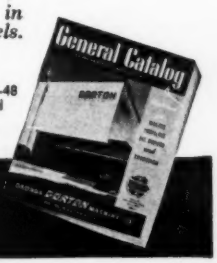
NEW GORTON 3-48 VERTICAL MILL

Compare These Features ⟩ with any No. 4 Milling Machine

- Designed for high-speed and carbide milling
- 76-inch table; 48-inch table travel
- 46-inch saddle with hardened wear plates at each end
- 24½-inch Fullwidth knee
- 15/7½ H.P. spindle motor — drives spindle only
- 5 H.P. feed motor
- 36 speeds; 25 to 2,000 R.P.M.
- 3 Feed Ranges available
- Square-Lock bearing guides with long length-to-width ratio
- Dial-type horsepower load meter
- Interchangeable Assembly unit construction
- 100% mechanical and electrical overload protection
- Removable coolant pan for easy clean-out

Above features also available in Horizontal and Universal models.

Write for Catalog 2585, which describes 3-48 Vertical Mills, and 1206-1655 Gorton General Catalog.



GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1206 RACINE ST. • RACINE, WISCONSIN 56-3

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A 8736-1P

CIRCLE INFORM-A-GRAM KEY NO. 61

NEW ERICKSON EXPANDING-COLLETS

The new Erickson Expanding-Collet is the only known commercial expanding arbor that can grip in a hole as small as ⅛ inch. That's because it's a one-piece arbor actuated in the same manner as a reversed collet . . . a collet which grips the workpiece on the *inside surface*. Because of its one-piece design without drawpin, it gives maximum wall thickness and full gripping power equal to that of a collet.

That means you can convert your machine to internal chucking by merely inserting the new Erickson Expanding-Collet. And since it is machined in place on the machine, it gives greatest possible accuracy . . . can be re-machined for new jobs . . . solves the rush-order problem.

Order a stock of new Erickson Expanding-Collets. They'll save your time, your temper and your money.

AA-3301

Write for your free copy of *"Erickson Expanding-Collet"* today. And also request "Catalog K"; you'll find cost-slashing applications for all Erickson holding tools.

APPLICATIONS

LATHES • TURRET LATHES • SCREW MACHINES
SPEED LATHES • AUTOMATIC CHUCKING MACHINES
BURRING MACHINES • MILLING MACHINES • DRILL PRESSES
CUTTER AND CYLINDRICAL GRINDERS • GEAR CUTTERS
INDEXING HEADS • COLLET CHUCKS • ETC.

ERICKSON TOOL COMPANY

2301-6 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 42

editorial :

Automatic Control of Machine Tools

AUTOMATIC CONTROL OF individual machine tools is, increasingly, commanding the attention of machine tool builders, users, and electrical equipment manufacturers.

This was most evident at the recent 20th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation.

From the several papers on different phases of the subject which were presented, we got an insight into the number of machines which have been and are being built to take advantage of the many benefits to be derived from such systems.

These benefits are in the form of all-important production economies which evidence themselves in reduced machine setup time, reduced machining time, increased uniformity in parts produced, and the requirement of lesser skill on the part of the operator.

To make a machine tool's sequence of operations fully automatic, its various movements must be powered rather than of manual manipulation. Each powered movement must occur at the right time (sequence) and for the right length of time (duration). When this is accomplished, the machine's program of operations results in a workpiece which conforms in all respects to the initial drawing.

At the risk of over-simplification, we can say that the automatic operation of a machine tool consists of a controlled program of power impulses applied to the machine's movements in predetermined sequence and with each of proper duration.

The controlling program for the power impulses must, for the accomplishment of repetitive manufacture, be repeatable. This suggests magnetic or perforated tape or punched card systems, all of which are in use. Each time the tape (or card) is "played" the machine goes through its paces and another piece is produced.

At the Westinghouse Forum, D. N. Smith, Manager of Development and Research, Jones & Lamson Machine Company, predicated a technical paper on their work in this field with a remark of considerable import. He said, "Our decision to develop a numerically controlled turret lathe was prompted by two important characteristics of the metalworking industry. First, about 75% of the entire industry is concerned with the production of lots of less than 25 pieces, and second, the vast majority of machining operations is limited to the production of rectangular forms, such as lengths and diameters."

Mr. Smith's statement, interpreted in terms of market potential, shows that application opportunities for the single, automatically controlled machine tool, be it turret lathe, milling machine or cylindrical grinder, penetrate our economy way beyond the limits implied by the highly-automated production lines of the Detroit car builders. For every multi-million dollar automotive engine machining line, there are, of course, literally thousands of plants "concerned with production lots of less than 25 pieces."

In the field of toolmaking, the automatic machine tool is in its ascendency. We have long been familiar with mechanical tracer-controlled methods for two- and three-dimensional duplicating. Now, in the light of recent developments, the "information" represented by the contours of the master flat template or three-dimensional model can be numerically recorded on magnetic tape and played back to control all the feeds, speeds, and positions of a vertical milling machine.

For a quick look into the future: The rise and fall dimensions for a screw machine cam could be recorded on tape; via land line or radio channel this tape intelligence could be transmitted to produce a duplicate tape in a plant a thousand miles distant. The new tape, fed into a cam grinder, would dictate the machine's motions in machining a cam in conformance to the initial specifications.

What these developments could mean in the way of branch plant operations or in the event of a national emergency, we are perfectly willing to leave to your imagination.

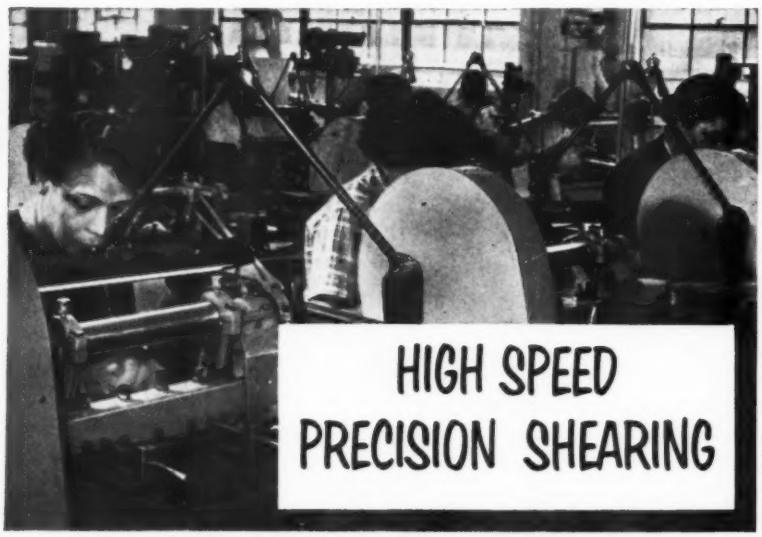
Editorial Index

DEPARTMENTS

PUBLICATION PREVIEWS 134
Capsule description of current literature. Bulletins, brochures, catalogues and circulars — You name it.

SHOP AIDS 172
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PROGRESS ON PARADE 174
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.

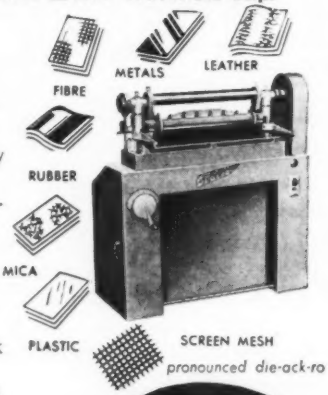


Production shearing of nickel sintered plates to ± .010" at Sonotone Corp.

DI-ACRO POWER SHEAR

COAST TO COAST FAVORITE FOR—

- **PRECISION**—strips less than .025" wide accurately sheared, parts exactly duplicated.
- **CUTTING SPEED**—from 30 to 200 strokes per min. Continuous and single stroke operation.
- **CAPACITY**—16 gauge sheet steel.
- **SIMPLICITY**—no experience needed to operate.
- **RUGGED CONSTRUCTION**—backed by warranty.
- **SELECTION**—four models, immediate delivery.
- **ECONOMY**—price and operating costs are rock bottom.
- **ENGINEERING SERVICE**—always at your disposal.



SEND FOR SHEAR MANUAL
Consult the yellow pages of your phone book for the name of The Di-Acro distributor near you or write:

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO., 315 8th Ave., Lake City, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 64

EDITORIAL: Automatic Control of Machine Tools 63

— FEATURES —

RECRUITING ENGINEERS: "Honors: Precursors to Success", by Dr. Winston E. Kock, Bell Telephone Laboratories 24
Facing a serious shortage of engineers and scientists, industry is conducting an intensive search for college graduates, who, in addition to good scholastic standing, have qualifications for honor society membership.

RULES: "Rules of the Game" by Dr. Erwin K. Taylor, Industrial Psychologist 46
Every game has its "general" and "ground" rules which are necessary to avoid confusion among the players. Dr. Taylor contends this concept applies equally well to plant management.

TOMORROW'S ENGINEERS: "Sell Yourself to Tomorrow's Engineers . . . and to the Community", by Carol E. Reuss, Associate Editor 66
A resume of the "Panorama of Progress" and conference sessions held in connection with the Fiftieth Anniversary celebration of founding cooperative education at the University of Cincinnati.

MATCHED MOLDS: "How to Design Your Matched Metal Molds", by Sidney D. Yarm, Bassons Industries Corp. 70
The essential characteristics of a reinforced plastics molded part, and the advantages and disadvantages of aluminum and steel as mold material should be considered when designing a matched mold.

MAGNETIC DIES: "Magnetic Dies Cut Tooling Costs . . . Eliminate Production Delays", by C. L. Krueger, Massey-Harris-Ferguson, Inc. 71
Mr. Krueger relates his experience in speeding production of sheet metal parts and reducing investments in dies and die storage space by using magnetic dies.

CONICAL HOLE GAGE: "Precision Gaging of Conical Holes", by W. M. Halliday, England 76
Gaging the major diameter of conical holes is simplified by use of the gage described by Mr. Halliday.

Editorial Index

VERTICAL CHUCKER: "New Vertical Chucker for Machining Large Forgings and Castings" 79

The increasing demand for automatic chuckers with large capacities has been met by the newly developed Acme-Ryder vertical spindle machine.

INDUCTION HEATING: "Induction heating Aids Formation of Spring Eyes." 80

Forming the "eye" on the ends of door closer coil springs is performed on a production scale by the method described.

PRESS CONTROLS: "Safety Considerations for Press Controls", by D. T. Kennedy, Danly Machine Specialties, Inc. 81

The primary function of any press control is to provide the greatest possible protection for the operator. Machine protection must also be considered. The author points out some control design features which are important to safety.

HELICAL CUTTERS: "Helical Carbide Cutters Improve Spar Milling," by Joseph F. Liebscher, Kennametal Inc. 85

A tricky problem in machining extruded aluminum spar caps was solved at Douglas Aircraft by using helical carbide milling cutters.

AUTOMATIC WELDING: "Adapters Facilitate Automatic Welding of Inside Seams" 89

Equipment and methods employed in welding the inside seams of long cylindrical vessels or tubes of relatively small diameter are described in considerable detail.

MACHINE MOTIVATION: "Hydraulic or Mechanical Machine Motivation?", by Frank G. Zagar, Zagar, Inc. 163

Experience in building machines for many types of operations, using hydraulic and mechanical power equipment, has convinced Mr. Zagar he prefers mechanical power wherever practical.

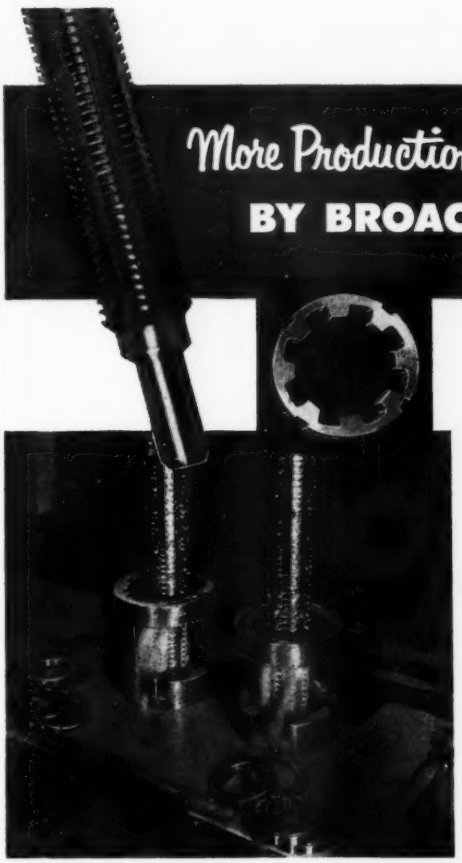
TUNGSTEN: "How to Work Tungsten," by J. M. White, Fansteel Metallurgical Corp. 102

PLASTIC TOOLING: "Advantages of Plastic Tooling," by Fred Lyijynen, Chrysler Corp. 115

DEPARTMENTS

COMMENDABLE COMMENTS 43
WILL YOU BE THERE? 52
MANUFACTURING MEMOS 58
GROWING PAINS 147
MEN YOU SHOULD KNOW 150
CALLING CARDS 160

More Production, More Profit
BY BROACHING . . .



Internal broaching of a cam ring. Note the complexity of the ring design. The steel is soft and tends to tear, yet this Continental Broach sizes the I.D and cuts 8 splines 5/16" deep in one pass.

REMOVE STOCK TO PRECISION LIMITS—FAST . . . ROUGH AND FINISH IN ONE PASS!

The scope of Broaching has broadened in recent years. Many broaching operations do precision work in far less time than other metal-cutting methods.

Continental Engineers have for years been designing all types of cutting tools and broaches. They can recommend without bias your most economical way to do the work.

For facts about increasing your production by broaching, call in your local Ex-Cell-O representative—or write Continental in Detroit for Cutting Tool Catalog.

CTW

Continental

CIRCLE INFORM-A-GRAM KEY NO. 65

Industry's "selling tools" are shown on the opposite page. An exhibit jointly sponsored by 12 machine tool builders is seen in the lower portion of the picture.

Sell Yourself TO TOMORROW'S ENGINEERS . . . AND TO THE COMMUNITY

By Carol E. Reuss
Associate Editor

MODERN BUSINESS MEN AND MODERN business techniques are a far cry from those of the John D. Rockefeller-Andrew Carnegie era. Today's successful industrial leaders are "career men" in business; most never hope to own any large part of the corporations of which they are a part.

Basically, the industrial leaders hold positions of "stewardship," carrying with them responsibilities to their employees, stockholders and customers, and to their community. The impressive business-civic records they have established are not all contained on the financial pages. They merit examination.

"We are salaried men, employed for all-around executive ability," is the way Mason M. Roberts, General Motors Vice President and General Manager of Frigidaire describes the men of modern management.

And, while they are naturally interested in the course of their company's progress, the number and variety of their outside activities caused Proctor & Gamble President Neil H. McElroy to note recently that it is "impossible for a business administrator to excell as a specialist nowadays."

Contrary to some popular opinion, industrial management's sole interest is not profit. "Profit," says Mr. Roberts, "is but the measure of the degree to which a business serves the public interest." Management's interests today are combined in the company and the community. In other words, "private enterprise" serves a very "public" function.

While this evolution of management from the tycoon era to the present, when social responsibility is paramount, is evident, it often

remains neither fully appreciated nor understood. The public must be "sold" on the idea and fact that the men of management do not live by the dollar sign.

An Opportunity to Sell

Industrial management accepted a bid to tell its story recently through conference sessions and an exhibit at Cincinnati, Ohio, when the University of Cincinnati marked the fiftieth anniversary of the founding of cooperative education.

Led by Universtiy of Cincinnati benefactor Frederick V. Geier, President of The Cincinnati Milling Machine Company, more than 100 executives developed a week-long program on the University campus. They demonstrated the progress resulting from Industry's joining forces with education by:

- Saluting the University and the founder of the cooperative education program, the late Dean Herman Schneider,
- Viewing American industrial progress during the last half century,
- Emphasizing to youth that the manpower to meet the challenges of the future will come only through advanced education and training, and by
- Acting to stimulate pre-college students who were invited to the celebration to prepare fully for future opportunities and obligations.

Visitors from all levels and types of business in Ohio and surrounding states saw, in the activities of the celebration sponsors, a sample of the responsibilities and obligations American industrial leaders assume. Perhaps they too will now be motivated toward lending a hand in similar "extracurricular" projects.

Executives sponsoring the program at Cincinnati are aware of the fact that not every person going into business will rise to administrative positions. Nevertheless, Henning W. Prentis, Jr., Board Chairman of the Armstrong Cork Company, maintains that today "men see in business something beyond the mere making of money." They find "satisfaction of spirit," he contends, "in the direction of their brains and energy toward the creation of a better economic day for the human being who toils with his hands."

Mr. Prentis cites the present time as the period having made the greatest contributions "toward the goal of sounder trade morals, higher business ethics, and a keener sense of responsibility for the welfare of the working man."

Other conference participants serve as additional proof of these words. Among them, Charles F. Kettering; Caryl P. Haskins, President of the Carnegie Institution of Washington; Cramer W. LaPierre, Executive Vice President of General Electric; Cyrus Osborn, Vice President of General Motors; Stanley C. Allyn, President of National Cash Register; Raymond T. Loewy, industrial designer; Charles R. Hook, Chairman of Armco Steel; and Laurence C. Hart, Vice President of Johns-Manville.

Some of the thousands of school children from areas surrounding Cincinnati are seen below as they line up to view the "Panorama of Progress."

Industry + Education = Co-op

Industry plays a special role in cooperative education, and Industry re-emphasized its interest in education and the community in the special celebration at the University of Cincinnati.

The Co-op program is an integrated plan of classroom study and related practical work experience. Co-op students alternate campus study of theory with equal periods of application by working in businesses in their specialized fields.

In the College of Engineering, for instance, students alternate stipulated numbers of weeks in the classrooms with a like period working for steel companies and machine tool builders, appliance, aircraft and automobile manufacturers, power companies, and so on. While on the job they work in the machine shops, on the drawing boards, and in the laboratories, progressing to different jobs as their capabilities increase.

Co-op companies continue the students' education by planning and executing additional training programs within their companies.

The program began at the University of Cincinnati in 1906 with 27 young engineering Co-ops. Today there are more than 3,000 Co-op students in the University's three cooperative colleges: Engineering, Applied Arts, and Business Administration. These students are employed by some 600 companies in 75 industrial centers. The majority, however, are located in Cincinnati-area businesses.

What's the Return?

The men of management don't ask for rewards for their work. Their companies, under the Co-op plan, take the students into their plants and offices, train them, and pay them. What do these firms get in return?

Most executives agree that cooperation with the University is one step toward meeting Industry's need for trained workers and qualified leaders. In fact, management makes every possible attempt to keep the same Co-ops in their companies, if they are satisfactory workers, throughout their five years of Co-oping and then after their graduation.

The Delco Products Division of General Motors employs approximately 24 Co-ops in its plants and offices. "We strive to keep them throughout their college years and after because they know our company and our methods by then. Consequently they begin early to make contributions toward the company's success," commented one Delco placement officer. He was present at the University program to help explain to others his company's part in the system and in the American industrial picture.

About one-half of the Co-ops stay with the company they worked for while Co-oping. "This system does not **solve** the serious shortage of engineers," cautioned another company personnel officer familiar with the Co-op program, "but it does help to alleviate it." His company still makes about 10 job offers for every engineering job that is open.

The draft board can be blamed as the cause for many Co-op students not returning to their Co-op companies after graduation. In many instances the Co-op returns from the Service with different ideas about where to locate and what type of work to do.

The Cincinnati Milling Machine Company, one of the first to enter into the Co-op program, employed 61 U.C. Co-ops this year. Estimating that one-fourth of these were seniors, and considering that 50 percent of them stay after graduation, Cincinnati Milling will end up with about eight full-time college graduates already familiar with the company's operations. Other companies benefit from Cincinnati Milling's cooperative efforts, too, when graduates seek permanent jobs elsewhere.

Chrysler Corporation employed 54 U.C. co-ops this year; National Cash Register Company, 38; Sheffield Corporation, 22; Bendix Aviation, 18; Glenn L. Martin Company, 12; and the Cincinnati Shaper Company, 10. They all hope to interest the Co-ops to seek full-time employment in their companies.

Many of these firms also hire Co-ops through cooperative programs with other colleges and universities. A Whirlpool-Seeger Corporation representative mentioned in Cincinnati that his company takes "as many Co-ops into its plants as possible" through numerous Co-op programs. Yet the company still has to scout all over the country for young engineers be-

Frederick V. Geier, Chairman of the University's National Sponsoring Committee, sets the pace in "Selling Industry."

cause their needs are so great.

Both break-in time and labor turnover, according to University records, are reduced considerably by the cooperative education program. Students get acquainted with companies and types of work while in college. If, when they are in their Co-op jobs, they do not like a particular type of work or company, every effort is made to adjust their programs the next time they "go into the field."

The Proof of the Program

Cyrus R. Osborn's industrial service record illustrates how General Motors benefitted from participating in the Co-op program. Mr. Osborn started working for the Delco Division of GMC as a Cincinnati Co-op and continued working for General Motors after receiving his degree in mechanical engineering in 1921. Since that time he has held executive positions in nearly every non-automotive division of the Corporation. He is now a GMC Vice President.

Walter W. Tangeman, Vice President and General Manager of the Cincinnati Milling Machine Company, started there as a lathe operator and worked his way through different divisions of the company while carrying on his college course in mechanical engineering at U.C.

Both of these men have "sold" Industry to the public through their outside-the-office activities . . . and especially by their continued support of the educational systems of which they themselves were products.

Mr. Osborn's sponsorship of the "Panorama of Progress" at the University celebration is but one example of his interest in serving for the public's interests. A composite of educational exhibits dramatizing America's industrial and scientific progress, the Panorama was conceived by Mr. Osborn to urge pre-college visitors to continue their education and take up the challenge for future progress that was described to them by the conference speakers.

Men of Industry, he maintains, always "find the hour and the urge to pass to them (the young people) something of the spark which has made the past half century so successful."

Seventy-five companies from 24 cities staffed specially-built exhibits at the Panorama of Progress to encourage the thousands of high school visitors to prepare to assume their places in Industry. "We're not selling anything," a General Electric engineer at the Panorama said, adding quickly, "I mean we're not selling any **products**" at the Panorama. A jet engine, cutaway and moving, intrigued students at the G.E. exhibit.

Bendix Aviation Corporation told the story of the more than 8,000 engineers who develop and produce instruments for the aircraft, automotive, marine and electronics industries. Would-be engineers had a chance to check auto engine cam profiles with electronic gages and compare their measurements with those given by micrometers used in the past, at the Cadillac Engine Division's display.

The Cincinnati area's machine tool builders united at one large exhibit to show what education means in the design, manufacture, and use of machine tools. Armco Steel Corporation and Youngstown Sheet and Tube jointly manned a 30′ working model of a hot strip mill.

Regional Science Fair and Junior Achievement winners also were recognized by Industry during the week. It is vital, admonished Junior Achievement leader Laurence C. Hart, to "inculcate in them the firm convictions relating to the private competitive enterprise system and the blessings which it provides."

Although probably no products were sold, on this one occasion Industry was able to sell itself to its co-workers, the communities in which much of it is located, and to thousands of youngsters who are now in the "wondering about the future" stage.

Customers and suppliers perhaps noticed a company's participation in the program and may think more highly of that company because of it. A young boy or girl may have decided to struggle along with higher mathematics and chemistry, and to go on with his or her education. Employees of a participating company may have received an entirely new and satisfying concept of their company's stature in the community. Many, presently less civic-minded, people in Industry may now open their plants to Co-op students or may sponsor a Junior Achievement company.

"Education and manufacturing are good," Charles F. Kettering, the nation's top industrial research scientist and inventor, reminded visitors in Cincinnati, "only when they are contributing to the general welfare of the community in which you live."

By the same token, service to the community is service to self. Throughout the country there are many outstanding examples of service to the community being rendered by manufacturing executives. But, the extent to which Cincinnati's industrial leaders have cooperated in the local University's program stands as an example and a challenge to others. The University of Cincinnati's spectacular fiftieth anniversary program was merely a reflection of the 50 years of coordinated Industry-Education action. ΩΩ

. . . From the Molder's Viewpoint

How to Design Your Matched Metal Molds

by Sidney D. Yarm
Asst. Chief Engineer
BASSONS INDUSTRIES CORP.
New York, New York

THE AIM OF THE REINFORCED PLASTICS MOLDER is to provide the least expensive tooling which meets the customer's requirements as to quality, performance, and delivery, at the lowest practicable piece price, including amortized cost of tooling.

In this article, I will attempt to summarize the most important factors to be considered in designing molds for medium and high production of reinforced plastic parts (from roughly 50 pcs upwards), with special emphasis on aluminum and ferrous metal molds.

The most essential considerations in the design of such molds are:

1. Quantity of parts required.
2. Part size.
3. Complexity of part.
4. Surface finish desired.
5. Whether trimming and blanking (including hole piercing) are to be performed in the molding operation or subsequently.
6. Likelihood and anticipated frequency of design changes in the part.
7. Type of delivery schedule involved.

Quantity of Parts Required

This factor, either alone or in combination with others previously listed, will usually determine the material of which the mold is made. Because of the great number of variables involved, no hard and fast rule can be applied, but it can be said, in general, that aluminum molds (either of cast construction or fabricated from alloy forgings or rolled plate) find their widest use in the range of 50 to 1000 (or perhaps even 5000) pcs, whereas molds of cast iron, Meehanite, or steel would most likely be utilized for quantities of 1000 pcs and up.

The more important advantages and limitations of molds made of these groups of materials are listed below.

Aluminum molds have the following advantages, among others, in most applications:

1. Easily machined; cuts down machining time and cost, both in initial production of the mold and in subsequent revisions.
2. Light weight; easily removed and replaced for short runs (as in aircraft work).
3. Good thermal conductivity and smaller mass for same size greatly outweigh higher specific heat; quickly heated with relatively low consumption of electric power or steam.
4. Non-corrosive.

Some of the limitations of aluminum molds are:

1. Comparatively soft, easily eroded or abraded; relatively limited production.
2. Built-up construction, if of aluminum plate (maximum thickness 2″ for widths over 6″), complicates mold manufacture, although this may prove advantageous when molds require frequent revision. Large forgings are available from mills, but require 6 to 8 weeks for delivery.
3. High surface polish difficult to maintain.
4. Require thicker mold sections to obtain desired strength.
5. Cast molds are often porous.
6. Shrinkage and distortion of castings require careful patternmaking and exceptional foundry control, especially where complex shapes are involved.

For cast iron, Meehanite, or steel molds, the following are the more obvious advantages:

1. Harder, less subject to abrasion or erosion, capable of extremely long runs (hundreds of thousands of pieces), with little maintenance.
2. Good surface finish can be obtained and retained; can be chrome-plated for easier part release.
3. Stronger molds; capable of withstanding higher molding pressures.
4. Relatively simple to include shear edges, either as hardened tool steel inserts or as flame-hardened portions integral with remainder of mold.

Limitations of ferrous molds include:

1. Heavy; harder to handle onto and off press.
2. More difficult to machine; higher machining cost and slower delivery.
3. Poorer heat conductivity and greater mass for same size overcome effect of lower specific heat; requires more power and time to reach operating temperature. More difficult to achieve good temperature distribution.
4. Subject to corrosion when not in use, if not carefully protected.

. . . Continued on Page 166

Mr. Krueger tells how he "beat the clock" on a tough re-tooling assignment, saved his company well over $200,000 and gave the sales and service departments a big boost by reducing parts cost and speeding up both initial production and parts service. How did he do it? By throwing away the book of habit and taking a fresh look at diemaking technology.

MAGNETIC DIES

•*Cut Tooling Costs*

•*Eliminate Production Delays*

by C. L. Krueger
Chief Tool Engineer
Batavia Division
MASSEY-HARRIS-FERGUSON, INC.
Batavia, New York

IN THE MANUFACTURE of a complete line of agricultural machinery, literally hundreds of parts are fabricated from sheet metals. The range of metal specifications and workpiece sizes and shapes calls for the use of just about everything in the book, as to die types and metalworking equipment.

Appreciate that much farm machinery could be in use for 20 years or more and the owner expects his orders for replacement parts to be filled, and promptly. Now add the fact that all farm machinery is subject to continuing change in design and that new special-purpose machinery is just as regularly being added to the line.

Also see "Magnetic Piercing Equipment an Asset to Job Simplification", by George Perz; TOOLING & PRODUCTION, Sept. 1952, p. 72.

It is easy to see why, in our business, a tremendous investment can be "frozen" in metalworking dies, plus the tying up of large areas of valuable floor space for die storage, plus "out-of-proportion" costs for limited re-runs of some parts, and plus another "frozen" investment in slow-moving parts inventories.

Our problem then was most obvious. Investigate every known technique which would (1) reduce initial investment in metalworking dies; (2) reduce number of press operations; (3) reduce contributing costs, i.e. storage space, labor time setting up press runs, and press downtime for job change-overs; (4) reduce investment in parts inventory; (5) reduce time required to get into actual production; and (6) reduce unit parts production cost toward maintaining competitive and, at the same time, profitable product pricing.

Fig. 1. First step in making up a magnetic die set is jig boring a pair of 3/16" thick steel templets to accommodate the punch and die parts. In this photo the die retainers with bushings are being inserted in the bored die templet.

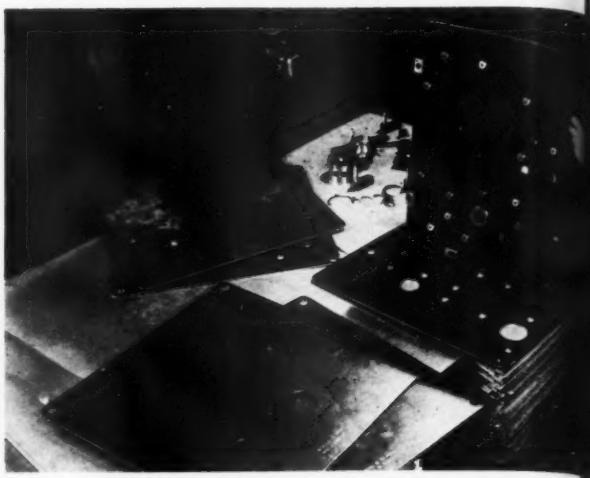


Fig. 2. On the opposite side of the templet, snap rings are placed around the die bushings holding the entire magnetized die and retainer securely in position. With all required punches and dies on hand, this assembly for piercing 21 holes was made up in approximately 20 min.

What brought these problems into sharp focus was an almost overnight addition of several new products to the company's already extensive line, with specifications for a half-million dollar tooling program and a "wanted yesterday" deadline.

Magnetic Dies a Life-Saver

After thorough analysis of all applicable factors, we decided to use the patented adjustable and re-usable magnetic dies, developed and manufactured by S. B. Whistler & Sons, for perforating and notching a number of the sheet metal parts required for these new products.

Estimates for the making of conventional single-purpose or custom dies for these selected parts ran approximately $80,000. All templets, dies, bushings, strippers, etc., to perform the same press operations by the magnetic die system figured approximately $45,000 — an immediate saving of some $35,000 in die costs. We also saved nearly three months' valuable time as against waiting for custom-made single-purpose dies.

Figure 5

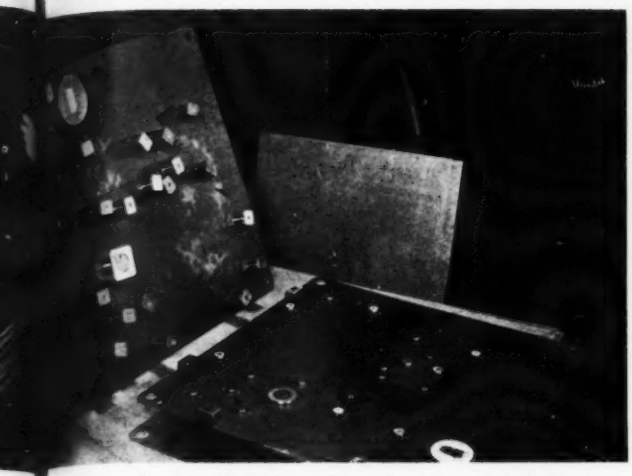


Fig. 3. Both die and punch units are similarly assembled, as shown in this complete die set, ready for the press. Note here two "special" shape punch and die units are included with an assembly of "stock" punch sizes.

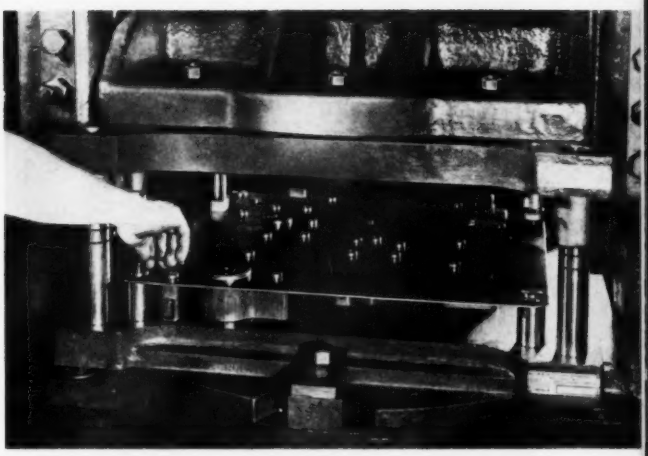


Fig. 4. Within approximately 10 min. of completion of one press run, a magnetic die set can be removed from the press and another set of templets with a different pattern of holes can be put into the press and production started on another job.

In addition to these two very important initial savings effected by our first use of the magnetic die system, it is almost impossible to estimate further savings over the years through the continued re-use of these same templets, dies and bushings in the same setups and in different die setups for other parts manufactured. It is safe to say this initial investment of about $45,000 has to date saved us close to $200,000 in custom die purchases.

From this initial experience, we have, within approximately two years' time, expanded our use of magnetic dies to a point where our "stock" investment in magnetic die equipment now stands at roughly $90,000. From this investment in re-usable magnetic dies, we can now assemble piercing and notching die sets right from "stock" for about 75% of the sheet metal parts required in the manufacture of the new product line.

In those instances where product design changes may call for hole sizes or shapes not presently in our stock, it is only necessary to notify the manufacturer by 'phone, wire or letter (depending upon time pressure) to get punches and die bushings in standard shapes and sizes delivered at once and most "special" shapes and sizes shipped within hours, as compared to days for the making of a custom punch and die.

From the accompanying photographs and their captions, fellow tool engineers and plant production executives can readily see how these magnetic dies have contributed immeasurably toward reducing our manufacturing costs and solving a number of other problems common to most manufacturing plants working sheet metals.

John Kelly, Figure 5, could be called our "librarian" for the magnetic dies department. Within a step or two of the caster-equipped assembly table is his library of templets. In clearly marked bins are a wide range of stock sizes and shapes of dies, punches, retainers and other parts. As shown in Figure 5, the last four strippers will be placed on the punches,

Figure 6

Figure 7

set screws tightened, and in two minutes this punch assembly unit will be on its way to the pressroom along with the die half of the setup.

To keep all templets and parts in a minimum of floor space and have everything right at hand, we constructed a welded steel rack, Figure 6, measuring 40″ deep x 84″ high x 156″ long. All templets bear a code number. A shop order merely gives the code number and time of day the die is wanted in the pressroom. John Kelly does the rest.

At the present time, the largest sheet metal part used in our farm machinery is a formed and pierced housing for a harvester. This part measures 9′ long x 20″ wide. Other parts range from less than a square foot up to roughly 6′ x 6′. We have found five sizes of templets will handle all work — 35″ x 42″, 24″ x 31″, 18″ x 26″, 13″ x 20″, and 12″ x 31″. Assemblies can be put on the press using one or a combination of these five sizes.

Note in Figure 6 that space is provided in the storage rack for sub-press dies for special size and shape holes, cornering, notching or piercing. Such dies can be combined with stock units in making up the die assembly. Also note how Kelly places a supply of the magnetized punch and retainer assemblies against the face of the steel cabinet.

New System Saves Space

Had the magnetic die system been developed sooner, a large part of the custom die investment and sizable storage space shown in Figure 7 could have been saved. In the foreground of this illustration, three parts of a two-section magnetic die assembly are on a floor truck. The fourth part was being assembled while the photographer snapped this photo.

Figure 8

Figure 9

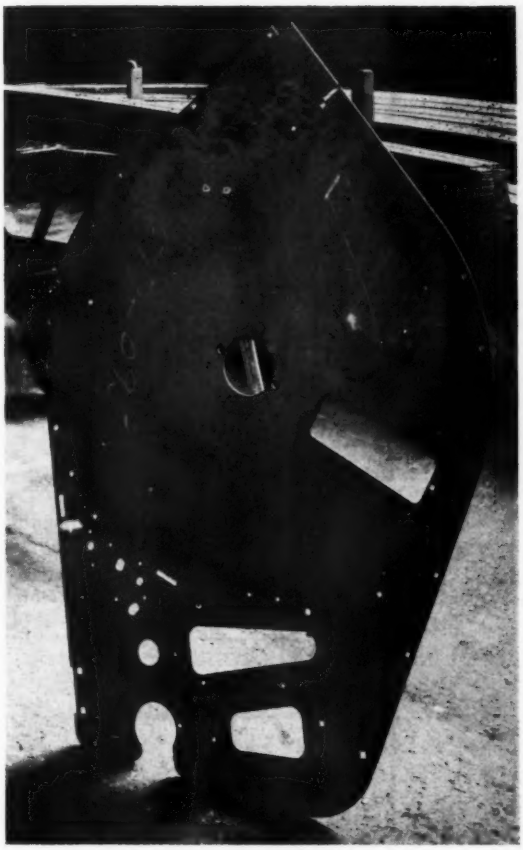


Figure 8 shows the same die set in production minutes later. The part, for a Ferguson Forager, measures 58″ x 38″ and is made in three operations from 3/16″ thick sheet steel. For this, the last step, the die set is made up in two sections, each templet measuring 35″ x 42″. At the time this shop order came through, circumstances were such as to make this an excellent application for the flexibility and economies inherent to the magnetic die system, as witness:

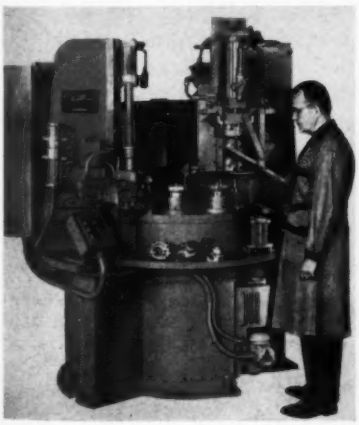
Only 100 of these Ferguson Forager parts were wanted . . . but in a hurry. And it happened this 300-ton Verson press and its three-man crew were idle, waiting for another job. The Forager die set was quickly assembled and put on the press. It took exactly 10 sec to lift the part, position it against the gages, pierce the last 30 some odd holes, and place the finished part back on the truck.

While the photographer was packing up after the last "shot" of the completed part (Fig. 9), this magnetic die assembly was off the press, the templets back in the "library," and all parts disassembled and back in the cabinet ready to be used again for an entirely different job. ΩΩ

Machine Assembles Precision Parts Automatically

Feeding, positioning, assembling and removal of parts are all done automatically by this new 8-station Robbins assembly machine.

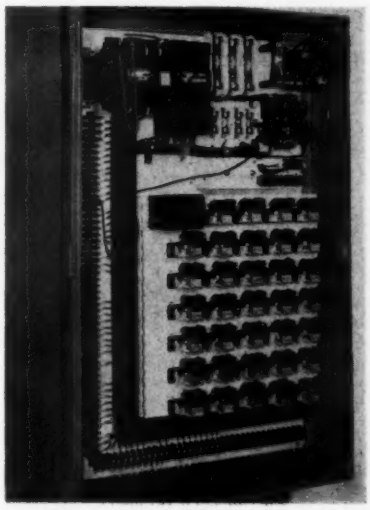
The parts consist of a needle bearing, a washer, and a seal which are assembled in an automotive steering gear end cover. Parts are automatically fed and positioned from indexing magazines, while the completed assembly is removed and placed on a conveyor automatically. Production rate is 720 completed assemblies per hour.

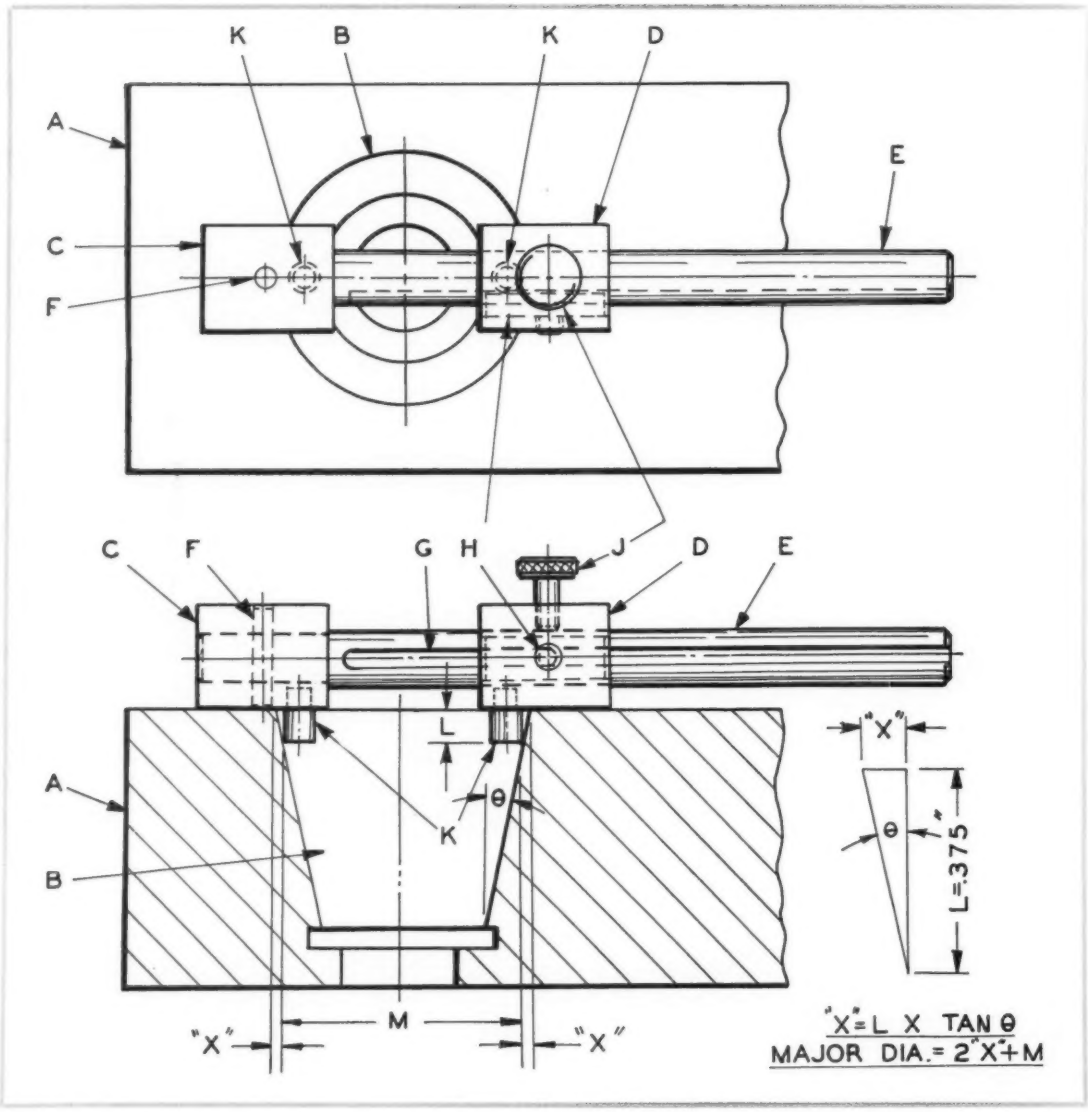


A specially designed panel with plug-in aircraft-type relays controls the electrical circuit. This panel is approximately one-third the size of the usual machine tool panel, to fit today's space conservation requirements. Controls are provided which prevent assembly in the event that any one of the assembly is incorrectly positioned.

The index table uses both a barrel-type cam and a shot bolt for accuracy, and is operated through a magnetic clutch and brake which permit a one-second index and a four-second dwell. Dwell time is controlled by a synchronous timer and electrical interlocks at each station. Ways are hardened and ground, and lubrication is automatic.

The design and manufacture of parts feeders, and automatic assembly machines such as this, is the latest activity of the Omer E. Robbins Company, 24800 Plymouth Rd., Detroit 39, well-known builders of sine plates and other precision toolroom equipment. Since toolroom accuracy is essential to successful functioning of complex assembly equipment, this company's tradition of precision work is permitting them to move fast in this new area for increased production profits.





Precision Gaging of Conical Holes

by W. M. Halliday
Southport, England

By gaging the diameter of a conical hole at a certain known distance from its mouth, it is a simple matter to determine its major diameter to the closest accuracy.

THE ACCOMPANYING ILLUSTRATION shows the interesting design, construction features, and application of an unusual type of gage for obtaining the major or mouth diameters of bored conical holes. A gage of this kind will be extremely useful and time-saving for the machinist in checking taper hole diameters during the progress of machining operations; or for use in the inspection department where finished products have to be gaged to the closest tolerances.

In practice, when using conventional type measuring tools, such as the ordinary inside caliper, or the vernier caliper-gage for such purposes, considerable delay, trouble and inaccuracy in finished workpieces invariably occur. These objections arise because of the inadequacy of such conventional tools.

For example, the ordinary solid plug gage which is extensively used to check taper hole sizes, affords no guidance at all as to the sizes of the major and minor diameters of a hole. Such solid plug gages are in fact only useful for determining whether the hole is bored to the correct taper on sides.

It is customary practice for the machinist or component inspector to employ the ordinary vernier caliper-gage for taking such hole measurements. Unfortunately, the application of this tool presents great practical difficulties, especially in those cases where the major diameter of a tapered hole has to be measured with close accuracy. Even where strict precision is not required, use of such a tool will always be troublesome, protracted and unduly costly in skilled machinist's time, for the following reasons.

The contact-tips of the vernier arms have to be located diametrically across the hole in the truest fashion. It is impossible, however, to balance or register both contact-tips simultaneously exactly on the knife edge of the mouth of the bored hole; which point is coincident with the major diameter. The contact-tips have, in fact, to be entered a slight amount into the hole to assure the adequate 'feel' for such diametrical location. A skilled machinist can apply the vernier to a conical hole with the contact-tips entering into the hole only a matter of .010", and thus is able to obtain approximate results.

In any case the contact-tips must necessarily record a diameter somewhat less than the major diameter at the largest end of the hole; the difference between such diameters being dependent upon the depth of penetration into the mouth of the hole which occurs when locating the vernier.

Furthermore, there is no means available to the machinist for determining reliably the difference between the actual major diameter and the dimension obtained by applying the vernier in the above manner. Hence, serious inaccuracies are unavoidable despite the greatest care.

These same objections arise when using the ordinary spring-type inside caliper gage, because the tips of the legs of this tool have similarly to be located a certain distance below the edge of the conical hole to register them properly across its diameter.

Design of the Taper Hole Gage

The accompanying illustrations show the design and construction features of a unique type of gage designed specifically to overcome these practical objections. The diagrams also clearly depict the mode of application and use of this simple, precision type gaging tool. It is relatively inexpensive to produce, and is adapted so as to be easily adjustable for dealing with a great variety of hole diameters, ranging from a minimum size of about 7/8" upward. Where holes of smaller diameter than this have to be gaged, the tool may be easily modified, in a way which will be well understood from the following description of its construction and use.

In marked contrast to all conventional measuring tools and gages, as mentioned earlier, the essential measuring tips of this gage do not have to be delicately located and balanced upon the sharp edge of the hole mouth. Such tips actually make contact with the inclined walls of the bored hole being measured at a certain known depth along the inclined sides. Therefore, if the angle of taper on such sides is known — and in practice this is immediately obtainable from the angular setting of the lathe-slides — the major diameter of the hole is easily ascertained by setting the gage and making a simple arithmetical calculation. The gage permits such diameter to be measured with a degree of accuracy wholly impracticable by the conventional tools and methods.

The diagrams show the gage mounted in place on workpiece (A) for checking the major diameter of the deep conical hole (B), whose sides are inclined to the angle $\ominus$ as shown. The minor diameter at the bottom of the conical hole is quite inaccessible; hence, to insure its desired close accuracy, it is essential to control the major diameter, depth, and angularity of the sides to the closest tolerances.

The gage comprises the two rectangular blocks (C) and (D). These are identical in size and shape, and are made of hardened and

accuracy.

ground steel, finished to exactly the same degree of precision on all dimensions and surfaces.

Member (E) is a hardened and ground steel guide bar, which is reduced slightly in diameter at one end to form a parallel concentric shoulder. This reduced end is press-fitted into a hole bored through block (C). The hole is located perpendicular to the vertical side and parallel with the base surface of the block which rests upon the top of the workpiece adjacent to the mouth of hole (B). The bar is permanently retained in the block by means of the pin (F) which passes diametrically through the shouldered end.

Block (D) is similarly bored to suit the larger diameter portion of the bar, upon which the block should slide smoothly but with an absence of slackness. When so mounted on the bar, the undersides of both blocks should lie exactly in the same horizontal plane as shown. Such accurate hole alignments will best be obtained by clamping both blocks together for boring the bar hole through both at a single setting. The length of the projecting portion of bar (E) may be made any convenient dimension in accordance with the largest diameter hole to be gaged.

Block (D) is maintained in correct axial alignment with the fixed block (C) by means of the long keyway (G) milled along one side of the bar, and which is extended fully to the right-hand end of the member. A corresponding size keyway is cut along the side of the hole in block (D) and a hardened tee-shape key (H) is snugly fitted therein to engage closely within keyway (G). The block (D) may be fastened in any required settting along the bar (E) by the knurl headed locking screw (J) situated in the top of the block and which bears down upon the bar as depicted in the upper partially sectioned diagram.

Affixed to the underside of each block (C) and (D) is a hardened and lapped measuring peg (K). These members are cylindrical, of the same diameter and length, and stand perfectly perpendicular to the respective underside surfaces of the two blocks. They are thus exactly parallel and in line with each other. Each peg is situated close to the inner side of their respective blocks to allow for engagement within a hole of small diameter.

The diameter of such pegs is not critically important, except it will be advisable to make them some common dimension, eg., 0.250″ or 0.375″ as with the present example. The length (L) of such pegs is vital however. This length should be a standard, such as 0.375″ as with this example — or 0.500″ for a gage to be used in checking much larger diameter holes. This length dimension must be maintained to the closest accuracy in both cases. The end faces of both pegs are ground and lapped perfectly flat and square to produce a sharp edge. The latter should not be chamfered or rounded in any way.

Method of Using the Gage

The manner in which this gage is employed is extremely simple and rapid. First, block (D) is released so as to move freely on bar (E) by slackening screw (J). The two blocks are then placed on the machined flat upper surface of the workpiece, over the mouth of the conical hole, so that pegs (K) project into the hole as illustrated. Member (D) is then drawn along the bar away from block (C) until the two pegs (K) are positioned exactly across the diameter of the hole, and with their peripheries lightly touching the opposed inclined sides. The pegs contact the sides of the hole at depth (L). This preliminary setting of the gage is accomplished in precisely the same manner as when using the ordinary vernier caliper-gage. Block (D)

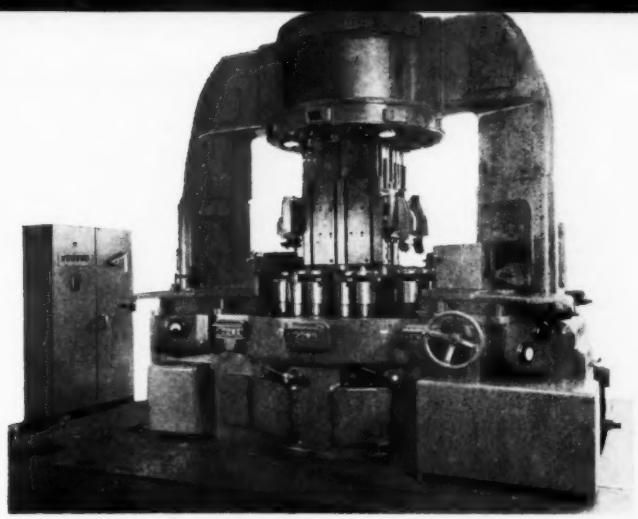
. . . Continued on Page 158

Readers should note that Mr. Halliday's design is especially applicable for small shops that have rather limited need for gaging of tapers. Caution should be taken in moving the contact when finding the true diametrical dimension, so as to not mar the bore surface if critical. If the checking of repetitive pieces is required, a flush pin arrangement could be substituted for the one contact in order to show whether the dimension is within prescribed limits.

Readers should also note that a taper hole gage is now commercially available for production gaging, having ball contacts that prevent any damage to work surface. Contacts are on slides that are adjusted to the nominal dimension, by means of a set-master. In use, the relative movement of the one (spring-loaded) contact is measured by a built-in dial indicator. Thus, exact deviations from the prescribed dimension may be charted for quality control purposes.

— Editors

NEW VERTICAL CHUCKER



for Machining Large Forgings and Castings

THE ACME-RYDER vertical spindle hydraulic chucking automatic is the answer to an increasing demand for automatic chuckers with large capacities.

Design of the machine is based upon that of Thomas Ryder and Son, Ltd., Bolton, England, combined with National Acme's experience to adapt it to American standards of performance.

First of the new series is an 8-spindle model equipped with 14" capacity chucks, 8 turning slides and 4 cross slides. The 4 "auto cross slides" can be operated on the vertical turret at one time to provide greater tooling adaptability for production machining of large forged and cast workpieces.

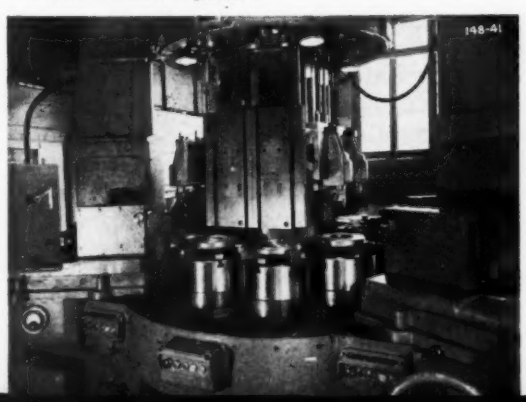
The cross slides complement the vertical end-working slides and provide flexibility and additional tooling operations heretofore not available in a single machining setup in these capacities.

Standard spindle speed range is 32 to 628 rpm. Three spindle speeds are available at each spindle position with each set of pick-off gears providing satisfactory speeds for various cutting requirements.

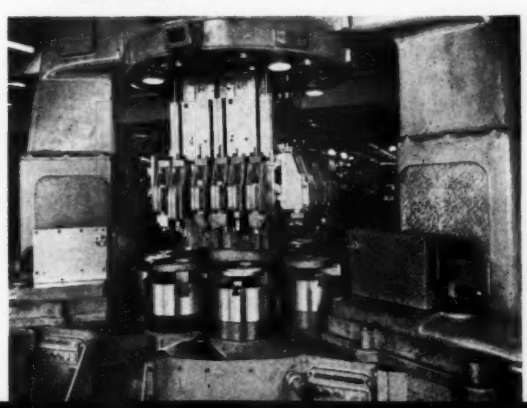
Positive indexing of the spindle carrier is by an independent indexing motor with hydraulically-operated locking and clamping at completion of index. Changeover from single to double index (or vice versa) is accomplished quickly by the removal or addition of a cam on the indexing tappet shaft.

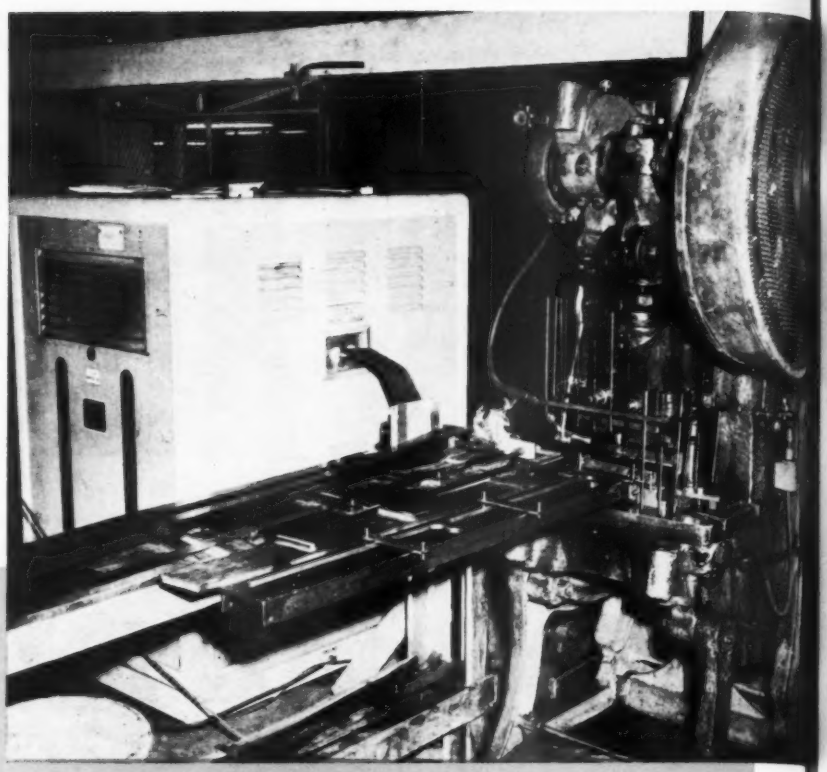
The electro-hydraulic system not only provides a convenient means of actuation and control, but also enables a number of electrical, hydraulic and mechanical interlocks to be embodied as safety devices to protect both machine and operator. Functions performed hydraulically include: opening and closing of chucks; engaging and disengaging clutches in the spindle drives; applying brakes at the loading stations; providing a reverse motion of the carrier to bring it back against the locating catch after indexing, then actuating a wedge to hold the carrier in that position; and clamping the carrier during cutting. ΩΩ

Close-up of front side tooling showing loading stations of the vertical chucking automatic set up for double indexing in machining both ends of a cast iron flywheel.



Rear side tooling view of the vertical chucker with double indexing. 26 operations are performed to complete both ends of cast iron flywheels in one machining setup. Total machine time, 43 sec.





Setup in the Norton Closer Division plant used for induction heating the ends of spring steel strips and then forming the heated end in a press die to produce an "eye". Strips later become coiled springs.

INDUCTION HEATING AIDS FORMATION OF SPRING EYES

SPRING-RETURN DOOR CLOSERS, such as are produced by the Norton Closer Division of Yale & Towne Manufacturing Company at its plant in Berrien Springs, Michigan, make use of coiled steel springs similar to those used in clocks but much heavier. Such springs are purchased as high grade (hardened and tempered) spring steel in loosely wound coils. Stock employed varies from 0.045″ to 0.065″ in thickness and from 1⅜″ to 2″ in width.

After lengths are cut, it is necessary to form a loop or eye at each end so that these ends can be fastened properly to closer components and the spring can be wound to perform its function. Before the loop forming is done, however, the ends have to be annealed by elevating them to a red heat. Forming is then done while the end is still at or near this temperature.

To do this job rapidly on a production scale, the setup here pictured is employed. It includes a press equipped with a suitable forming die and an extended table that is placed against another table attached to a Lepel induction heater of 7.5 kva capacity. Attached to the heater and overhanging the table is a water cooled copper induction coil shaped to heat one end of the strips as placed in the coil.

As soon as the end is properly heated, the strip is quickly placed on the extended table of the press and is set so that the hot end is in the die. Thereupon, the operator trips the press and the die closes, forming the heated end. Before the heated strip is removed from the coil, another is placed in heating position.

Timing is such that the heating of each piece is completed by the time the prior one can be removed from the coil, set into the die, formed and set aside. Consequently, production is practically continuous, once the setup is made and the first piece is heated. Heating requires only a few seconds and, with suitable coils, can be adjusted to fit or dovetail with the forming portion of the cycle.

There are, of course, stops that determine the correct position of the heated strip in the die at the instant of closing. It is easy to control the heat applied and the temperature attained, hence, uniform results are secured. After one end of a batch of strips has been formed, the strips are turned end for end and the second end is similarly heated and formed. ΩΩ

SAFETY CONSIDERATIONS FOR PRESS CONTROLS*

by D. T. Kennedy
Chief Electrical Engineer

DANLY MACHINE SPECIALTIES, INC.
Chicago, Illinois

IT IS OFTEN REMARKABLE how a reference to safety can cause normally alert people to lose interest. It seems to be a general rule that everyone approaches personal safety with optimism and complete indifference because of a firm belief that misfortune cannot strike at one's ownself, regardless of how careless he may be.

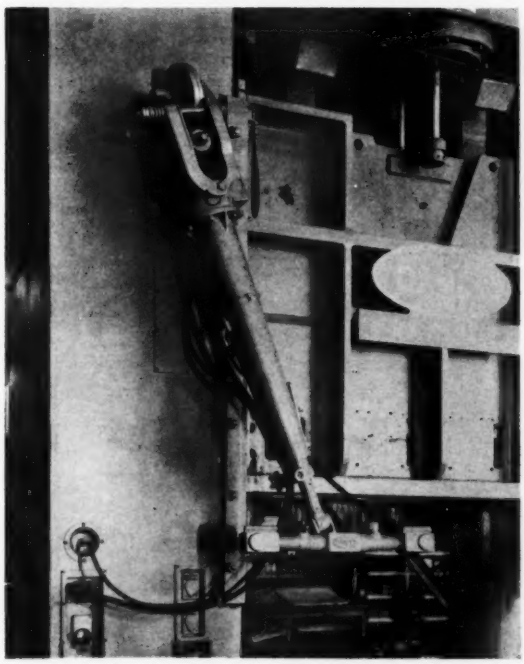
There is, therefore, a very real responsibility upon machine tool builders to provide safe, dependable controls, since production and maintenance personnel are, like the rest of us, all too prone to feel that each enjoys immunity to accidents.

The primary function of any control is to provide a means for operating a machine with the greatest possible protection for the operator. However, machine protection must also be considered since it is entirely possible that failure to provide proper protection for the machine can cause danger to the operator. For this latter possibility, hazards arising may be different from any that are normally considered.

It is basic to the design of mechanical punch presses that for all operators controlling a single press it must be necessary to depress two RUN pushbuttons at the same time before the press can make its stroke. The press will then continue through its stroke only after the dies of the press are closed. It is also basic that the use of foot switches or floor stands usually presents hazards, since to an extent dependent upon their design they allow the operator to have one or both hands free.

Protective methods such as press-operated bracelets for operators are usually irritating, and unless supervision is very strict these bracelets are quite frequently removed. Another and better approach for protecting the operator is obtained by mounting the pushbuttons on an adjustable control bar, Figure 1. For this operation the controls are mounted at about the height of the operator's head. This makes it difficult for him to operate the RUN pushbuttons with any part of his body except

Fig. 1. By mounting control pushbuttons on this adjustable control bar, the operator is required to keep his hands at head height during the press stroke.



*Presented at the 20th Annual Machine Tool Electrification Forum; sponsored by the Westinghouse Electric Corporation, Buffalo, N. Y., April, 1956.

Fig. 2. Safety blocks are made of magnesium or steel and are attached by chain to a plug. When the plug is removed, motor and control functions are interrupted.

his two hands. Too, this design requires that his hands be kept approximately 30" apart so that it is virtually impossible for the operator to operate both pushbuttons by using one hand and his elbow. The adjustable bar is provided with a finger rest so that the operator can grip the bar comfortably and conveniently.

Although hazards of electrical shock are relatively uncommon for modern machine tools, they can be reduced still further if common faults are recognized. Although a low-voltage electrical shock will not generally prove fatal, such shocks can cause a violent involuntary movement that can produce injury. One common fault in this regard is the mounting of pushbuttons, lights, or other electrical devices on a gasketed door or panel. It is not always recognized that the hinges and mounting screws do not provide a good connection to ground; a flexible wire connecting the panel to the press will usually suffice to correct this condition.

Other hazardous conditions can arise even when the main disconnecting means of the machine tool is opened; it is often necessary that an auxiliary power supply at line voltage or 110 volts be brought to the machine so that such activities as die regrinding and welding can be carried out. In such cases it is necessary that auxiliary power supplies be isolated from the machine tool control, that the wiring for these circuits be confined to separate conduits, and that these wires be placed on covered terminal blocks with a name plate to indicate that precautions must be taken.

Electrical hazards of yet another type can come about as the result of the high-fault currents that are made possible by the increased capacity of modern machine tool installations. These installations may have a potential short circuit capacity that in some instances can exceed 125,000 rms amperes. This capacity is sometimes available even to a 60-amp, type "A" fusible switch. Therefore, there is a definite hazard to people using the convenience receptacles which are commonly connected to the switches. The application of circuit breakers matched and interlocked with current-limiting fuses can possibly decrease this danger. A recheck of the plant power capacity before each new machine installation is made is essential, if machine tools are to be matched to possible fault conditions.

Fault conditions of another nature often result from the lack of fail-safe precautions. It must be recognized that any mechanical or electrical device can fail without warning and that the only really positive protection for the operator is to arrange his work so that he is prevented from entering the danger area. In certain instances this solution may be impractical. The danger area for the die tryout man for example cannot be avoided; it is for such cases that continued intensified study is necessary to avoid future tragedies.

Some tragedies that have occurred are the result of human errors, and as such could have been avoided by common sense precautions, such as by turning off the main power switch. In addition, the use of safety blocks can do much to reduce the hazards of die work. Safety blocks in use today are made of magnesium or steel. They are placed in the die on machined pads to prevent the dies from closing while under repair, and the block is usually attached to a plug and chain by welding or riveting, Figure 2.

To illustrate, this plug is shorted and connected in series in the control circuit so that all control and motor functions are interrupted when the plug is removed from the receptacle. It is necessary, of course, that the chain be short enough to prevent the safety block from being used while the plug is in the receptacle.

As another example of harmful operation, damage to multiple-action presses can result from die interference, Figure 3.

Should the inner-slide die flange strike the blankholder ring, it is likely that the bolts on the blankholder would be broken, thus causing the blankholder ring to fall.

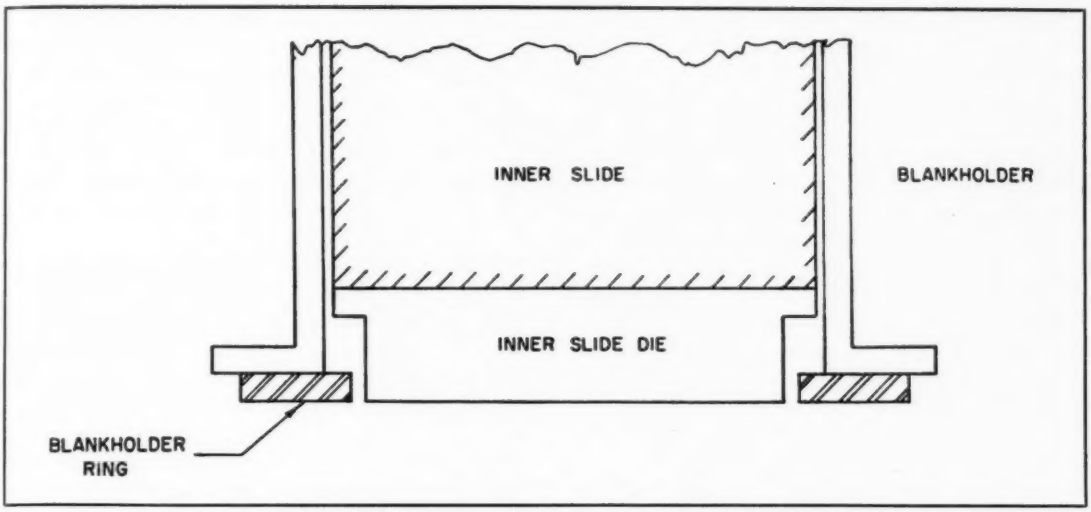


Fig. 3. Die interference can produce damage in multiple-action presses. If the inner-slide die flange strikes the blankholder ring, its bolts may be broken.

A positive means of preventing this occurrence, regardless of the position of stroke or adjustments of the slides, is necessary for every multiple-action press which has motorized adjustments. Further, it is necessary that this protection be independent of main rank position so that the slide may be adjusted at any point in the stroke without interference at or near bottom stroke.

Whenever the main switch is in the ON position, precautions must be taken to assure the operator of fault-free operation. One basic principle is that the circuits must be fail-safe. Some fundamental rules for the application of fail-safe circuits to presses are: (1) the control must cause the press to come to a stop as the result of a de-energizing function; (2) removal of power must cause the control to stop the machine, and the reapplication of power must not cause the machine to restart; (3) removal of voltage must not cause the machine to start or to continue operation; (4) failure of the rotary limit switch to continue its rotation after the dies close must not prevent the press from stopping; and (5) the clutch air valve must be of the dual-element type and be designed so that, if one element fails, the other element can function to stop the press at the top, and can function to prevent the press from being restarted in the event the operator again depresses the RUN buttons.

In addition to fail-safe circuits, checking circuits are a necessity on a large press since they offer a quick method for locating trouble and also help to reduce the need for temporary jumpers to start a machine in operation. For simplicity, these checking circuits should be available at floor level.

Press controls mounted in the press at floor level, Figure 4, allow a convenient check of controls from a location that permits observation of the operation of the press. Observation of the control while the machine is in operation allows the maintenance electrician to watch the sequence of operation of relays and other equipment, and possibly will enable him

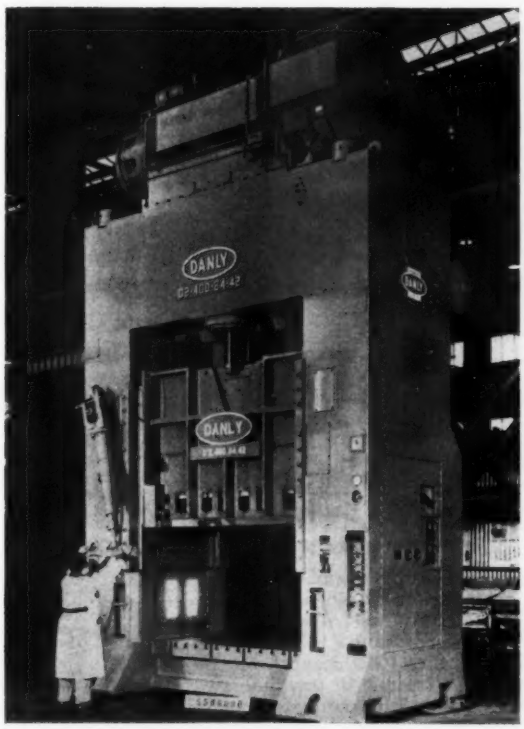


Fig. 4. Press controls at floor level permit a convenient check of controls and simultaneous observation of press operation.

to prevent a shutdown of production through advance knowledge of broken, loose or arcing parts.

As the requirements for more accurate slide and die alignment increase, lubrication becomes increasingly critical. In this regard, guiding and wearing surfaces should be protected by a system of oil pressure switches that monitor the flow of oil to critical parts of the press. These should give a visual indication that the flow of oil to a critical point has failed. By tripping a switch, a failure of oil flow causes the press to come to a stop at the top of its stroke and, in addition, prevents another stroke from being initiated.

In the case of a failure of hydraulic or air pressure, initiation of a stroke can be prevented by a lifter, iron hand, or other loading or unloading devices which remains in the die to prevent its closing. The correct sequence of loading and unloading devices can ordinarily be assured by using limit switches at the end of the return position of these devices. These limit switches should be wired in parallel with a rotary-cam limit switch, so that the press may be stopped at the top of its stroke. This is desirable since faulty operation of the devices might prevent their return.

By way of summary, it can be said that although safety must remain primarily a function of personal responsibility, the machine operator must be given as little opportunity as possible to display human error.

By the design of equipment that is safe under both normal conditions and also when the unexpected occurs, the designer can provide hazard-free operation for men and machines alike. ΩΩ

MULTIPLE-RAM PRESS PROVIDES BIG BED AREA

Throughout industry, press users have been plagued with a common problem — securing sufficient press bed area when only light tonnage is necessitated. This is especially true on jobs utilizing progressive dies.

Recently, a manufacturer was fast losing control of his specialty market. High manufacturing costs were opening the door to competitors, yet his own costs couldn't be trimmed. As a result, volume declined alarmingly causing him to search for a better, more economical means of manufacturing. An answer was suggested by Benchmaster, manufacturers of small punch presses, 1835 W. Rosecrans Ave., Gardena, Calif.

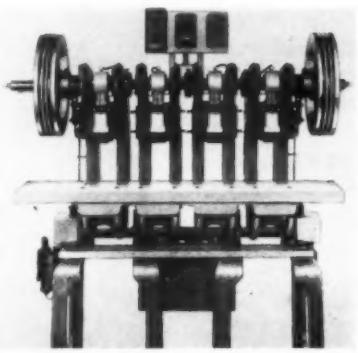
Benchmaster engineers had experimented with ganging several small Benchmaster presses in tandem, operating all rams off a single, common crankshaft. By splitting the die up in several segments and operating each segment on its own ram, several important advantages developed with unusual press versatility. Primarily, a generous bed area (10" x 46" x 1½") was available without wasted space.

Tooling became easier to maintain. At certain stations requiring more attention than others, duplicate dies were made. As a result, press downtime was almost eliminated being limited to the time required to substitute the reserve die set while the other was removed for re-sharpening. Die hazards were reduced. Failures were limited to separate stages, avoiding possible damage to the entire die.

Production speed increased almost 300% due to faster flywheel speed available on the smaller presses.

Crankshaft bearings are in alignment and permit use of a single oversize crankshaft. Two oversize flywheels, one at each end, replace the usual individual flywheels. Total capacity of the unit shown is 20 tons, allowing 5 tons for any one ram operation.

Total capital investment was considerably lower than for a single large press. Cost of the Multiple Ram Press was approximately ½ the cost of the single large press originally considered, and only 1/3 the cost of a second choice having adequate size for the operation. Since no station required more than 5 tons, a large premium would have been paid for excess tonnage in the large presses to gain the extra bed area.

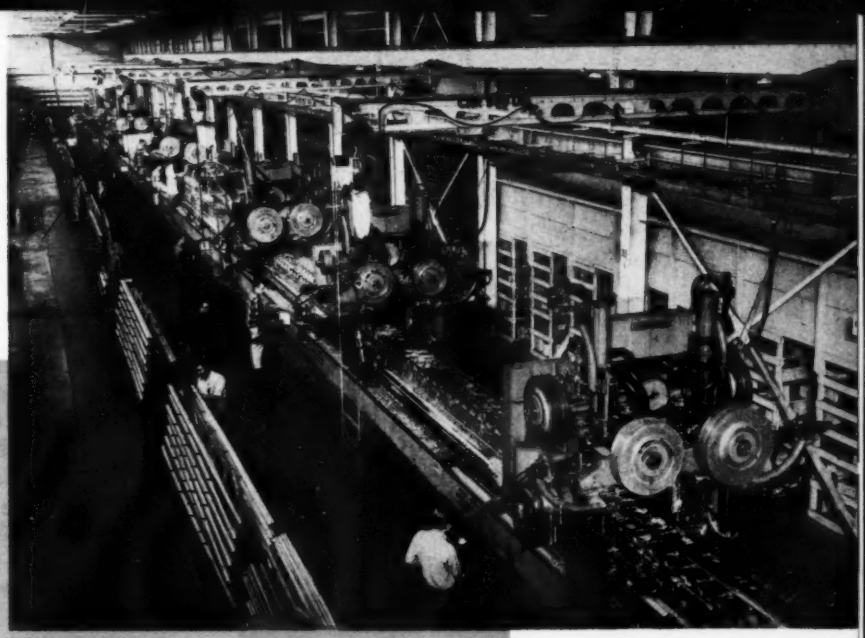


The same tandem arrangements are also available using Benchmaster 2-ton or 8-ton presses. All presses in the gang must conform in size, however.

Variety and versatility of the gang setup proves virtually unlimited. For example, center distances between rams can be varied and intermediate operations performed between press operations. Strokes of individual rams need not necessarily be of uniform length. This feature allows inclusion of short stroke rams for piercing and punching stages, for example, with a long stroke ram for bending somewhere along the line.

It is interesting to note also that rams can be furnished which descend simultaneously, alternately, or staggered at different time intervals. Perfect synchronization of all rams is apparent. Where slower strokes are required, the Multiple Ram Press can be equipped with back gears.

Design of the Benchmaster unit makes it practical to add any required number of units if more die stages prove desirable.



Photos Courtesy Douglas Aircraft Company, Inc.

Helical Carbide Cutters *Improve* SPAR MILLING

by Joseph F. Liebscher
Application Engineer
KENNAMETAL INC.
Latrobe, Pennsylvania

THE NAVY'S MODERN FIGHTING AIRCRAFT such as the Douglas F-4D and AD carrier based fighters are strong and rugged, largely because of unique advancements in aerodynamic engineering. However, part of the credit must be reserved for the ingenuity of the tool designer.

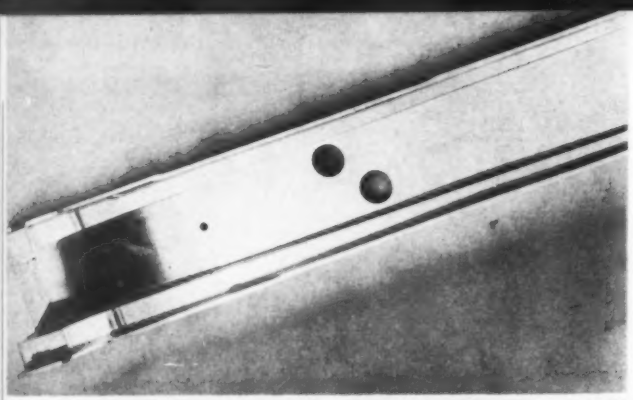
When Douglas Aircraft Company, Inc. specified single-piece extruded aluminum spar caps to be machined to 63 N.A.S. finishes and close tolerances, they passed along a tricky machining problem to the spar cap department of their El Segundo Division at Torrance, California. But their tool engineers were equal to the assignment.

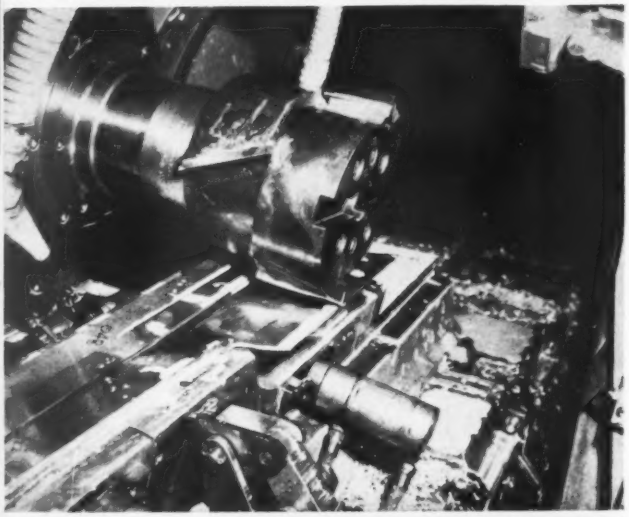
Also see "Helical Carbide Cutter Design Speeds Metal Removal", TOOLING & PRODUCTION, December, 1954, p. 55.

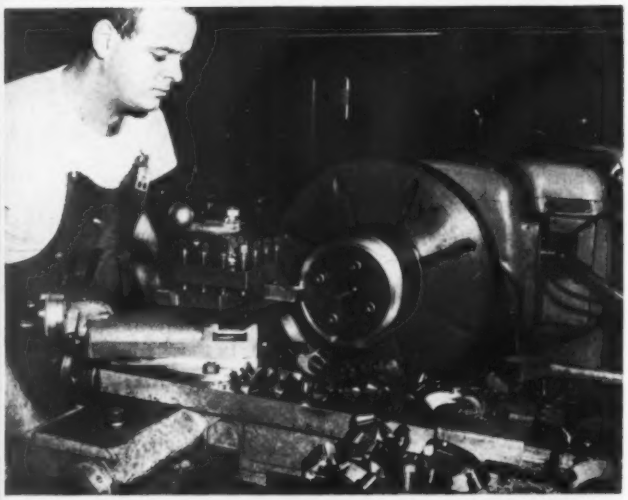
The operation requires intricate cuts (Figs. 1 & 2) to form channels, curved surfaces, and skin-thin sections. To perform this delicate milling operation at high speeds, Douglas uses an eight-carriage Farnham twist mill with a 308′ bed. Each of the eight carriages is equipped with two 40-hp, 3600-rpm, individually controlled cutter heads. Three of these heads are adaptable to horizontal or vertical twist.

Initially the operation was performed with conventional cutters. The cutters consisted of four flat tungsten carbide blanks, 3/16″ x ½″ in cross section, of suitable length, brazed in a steel cutter body at a 5° radial rake and 10° axial rake. The 5° radial angle results in a negative rake on the entry portion of the cutting edge which becomes a positive rake as the cutting edge progresses through the cut. The negative angle causes a scraping or pushing action, creating considerable buildup, which in turn produces a poor finish, consumes more horsepower, and produces fewer pieces per grind.

After extensive research, the writer, a Los Angeles district representative of Kennametal Inc., in cooperation with Douglas Aircraft tooling engineers, developed a milling cutter unique in design and efficient in performance.







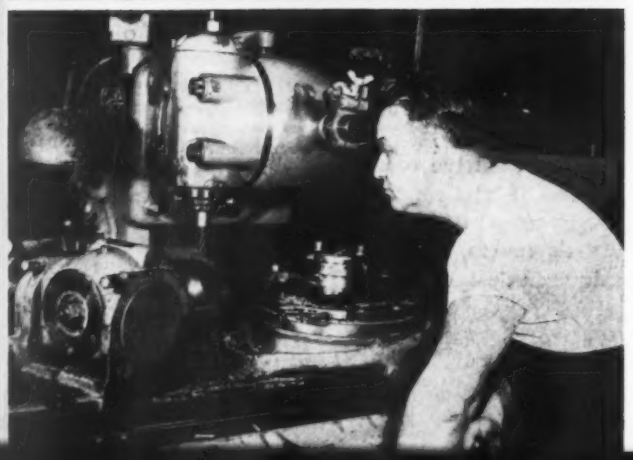


Fig. 1. Contour on a finished spar, milled with helical carbide cutters.

Fig. 2. Cutting a spar cap with a two-piece carbide cutter.

Fig. 3. Forming hub on helical cutter at 270 rpm and 0.015 ipr feed, taking a 1″ cut.

Fig. 4. Milling axial seat on spar mill cutter.

The cutter utilizes Kennametal grade K6 tungsten carbide helical inserts. The cutters are manufactured complete in the Douglas tool maintenance department, with considerable savings realized over the cost of purchased cutters. The helical inserts which are machine generated at Kennametal's Latrobe plant are supplied ready for brazing into the body.

The cutter bodies are machined at the Torrance installation using conventional machine tools. The body blanks are torch cut from SAE 1020 steel plate. The rough cut body is drilled and the mounting bolt holes are used to hold the cutter body blank (Fig. 3) while it is turned, faced, and bored on a 16″ lathe.

The milling of the gash, in which the solid tungsten carbide helical insert is to be brazed, is performed on a plain horizontal milling machine using a vertical head attachment (Fig. 4). The body is mounted on an indexing head which is set at 24° to the longitudinal axis of the table. Inasmuch as the style HF Kennametal inserts are generated with a helical face and a flat back, the gash in the body is made by making a straight axial pass with an end mill. This eliminates the need for complicated gearing setups which are required for carbide blanks that are helical on both the front and back face.

With the body completed, the next operation is brazing the carbide insert in place (Fig. 5). Again the use of the flat-back insert is advantageous. The fact that the mating surfaces are flat insures good back-up and an efficient brazed joint. The inserts are liquid honed and, using silver solder with a nickel shim, are induction brazed. Particular care is exercised in the brazing operation because of the critical necessity for a flawless brazed joint. The cutters operate at high peripheral speeds, and a failure could be very costly.

The grinding of the cutter is simplified by the face and peripheral contour being already generated into the insert and by use of the unique grinding fixture shown in Figure 6. It is only necessary to grind a land 1/32″ wide on the face of the insert and a 1/32″ land on the periphery of the insert.

The face grinding fixture utilizes one right and one left hand helical insert, each brazed

to a steel bar, bolted to a master holding block and clamped in position with the arbor nut. With a single master helical blade, all the cutter edges are ground alike. With equally accurate grinding of the periphery, a smoothly operating efficient cutter is assured. This is one of the factors which provides the excellent finishes obtained.

An alternative but equally accurate setup for grinding the faces of open, straight or closed angle cutters, is that shown in Figure 7. In this setup a round rod cam is set at the desired angle and the helix angle is generated by moving a follower over it with hand feed.

During the development of these cutters, it became evident that the definition of the terms relating to helical cutters needed clarification. The identification of hand of helix and rotation are made by viewing the cutter from the working face (Fig. 8), or that face which is opposite to the one adjacent to the driving source when the cutter is mounted. If the cutter rotates clockwise, it is termed left hand. Counterclockwise rotation of the cutter when viewed in this manner indicates it is right hand. The helix or spiral is termed right hand when the cutting edge moves from left to right as it moves away from the "viewing face". The opposite, that is the movement of the cutting edge from right to left, indicates a left hand helix. A cutter may operate with left or right hand rotation with either helix but the hand of rotation cannot be changed unless the cutter is designed for reverse mounting.

The combination of a 15° radial hook or rake angle and a 24° helical angle were found, after exhaustive tests, to produce the best results. Cutters with greater helix angles have a tendency to bite into the aluminum, which results in damage to the blades and the machine spindles. Kennametal grade K6 blades in cutters of this design have resulted in better finishes, longer production runs with less downtime, greater machine capacity through a higher metal removal rate per horsepower and freer chip action. The free chip action is due to the never-changing rake and helical angles.

The face and peripheral surfaces of Kennametal helical inserts are generated in the same

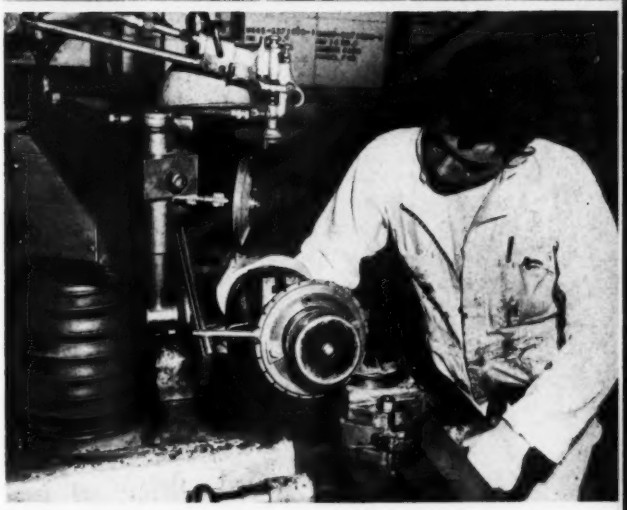


Fig. 5. Setup for induction (silver solder) brazing carbide-toothed helical spar cutter.

Fig. 6. Face grinding of helical spar cutter, using a detachable index and helical follower unit on a Cincinnati No. 2 cutter grinder.

Fig. 7. Face grinding of helical spar cutter, using a stationary follower.

Fig. 8. Carbide helical spar cutters. At left, cutter with left hand helix and left hand rotation; at right, cutter with right hand helix and right hand rotation.

manner as the helical flutes in a solid steel cutter would be machined. That is, they are formed into a helical blade from a slug or blank of pressed but unsintered tungsten carbide. This results in a metallurgically homogeneous product. Helical blanks which are produced by hot pressing or by bending after sintering do not exhibit this homogeneous characteristic. These methods disturb the crystalline structure, thereby causing metallurgical inconsistencies and, consequently, erratic results in use.

The Kennametal helical inserts are made in two basic styles — the helical face, flat-back style HF, which is the type currently being used by Douglas, and the full helix style HB, which is helical on both the front and back face. Both styles can be used for right or left hand rotation by milling the cutter body for the required rotation.

Test runs comparing the new design of helical cutter against the old straight face design showed great improvements. Milling spar caps of 7075T aluminum produced the following results:

TABLE I

	NEW HELICAL CUTTER	STRAIGHT FACE CUTTER
Carbide	Kennametal Grade K6 Style HF8 Inserts	Kennametal Grade K6 Style K1000 Blanks
No. of Teeth	2	4
Radial Rake Angle	15°	5°
Helix Angle	24°	—
Axial Rake Angle	—	10°
Cutter Diameter	8"	8"
Feed Rate	40 ipm	40 ipm
Width of Cut	1½"	1⅜"
Depth of Cut	1-3/16"	1-3/16"
Horsepower Required:		
1st Spar Cap	18 hp	22 hp
10th Spar Cap	23 hp	28 hp
20th Spar Cap	25 hp	30 hp
35th Spar Cap	25 hp	35 hp

With the old style straight face cutters, the horsepower required increased until it reached the limit of the machine. The horsepower required with the new style helical cutters remained almost constant. Milling the 100th spar cap required only 35 hp, and the finish was far better than the 63 N.A.S. required. The old style cutter was removed after producing 20 pcs because of a poor finish, and at this point the horsepower requirement had already reached 30 hp. Examination of the blades revealed dull and chipped edges.

Another run was made with the same two cutters after regrinding, as follows:

TABLE II

	NEW HELICAL CUTTER	STRAIGHT FACE CUTTER
Width of Cut	1.000"	0.625"
Depth of Cut	1.000"	0.875"
Feed Rate	40 ipm	40 ipm
No. of Spar Caps	1	1
Horsepower Required	10.5 hp	10.8 hp

In conclusion, the horsepower required for a given cut decreases with the use of either style HF or HB Kennametal helical face inserts due to the true helix angle on the face length of the inserts. Therefore, less power is required to drive helical blade cutters than straight blade axial angle cutters.

This new helical cutter, a joint development of Douglas Aircraft Co., Inc. and Kennametal Inc., has permitted increased production of better quality spar caps at lower cost. ΩΩ

Precision Center —

WHERE USERS AND MACHINE BUILDER MEET

Precision Center, another milestone in the development of better relations between machine tool builder and user, was opened recently by Brown & Sharpe of Providence, Rhode Island. Here the company will welcome its customers, who will have an opportunity to observe, discuss and study the application of the many types and sizes of Brown & Sharpe precision machine tools and industrial products to a wide range of manufacturing problems.

Brown & Sharpe's customers investigate the features of some gages, cutting tools and related products. In the background is the Grinding Machine section.

Screw machines, gages, cutters, grinding machines, milling machines and surface plates on display make this an exposition of the company's many products and services.

The Precision Center will be an ideal spot for supplier and customer to meet to resolve the problems both encounter in meeting today's manufacturing needs . . . and in anticipating tomorrow's.

ADAPTERS FACILITATE AUTOMATIC WELDING OF INSIDE SEAMS

INGENIOUS MODIFICATIONS of side-beam, automatic hidden arc welding machines have expedited the welding of inside seams in long cylindrical vessels or tubes of relatively small diameter. Two arrangements have been devised. In one, the welding head is carried conventionally on a carriage riding the longitudinal beam of the machine, and the electrode wire is fed through a ram or boom which may be moved in and out of the cylinder being welded. In the other, the head itself is mounted on the end of the boom, with the latter in both cases being rigidly attached to a frame on the traveling carriage.

An application of the first type of setup improved quality and lowered costs in the welding of air receiver chambers for mine sweepers at the plant of Automatic Welding Company, Elm Grove, Wis. The cylinders are type 304 stainless steel, 88″ long and 16″ O.D. Shells are ¼″ thick, dished heads $\frac{5}{16}$″. Butt welds are required throughout, all being 100% x-rayed for quality.

Initially, the containers were welded from the outside only, with permanent backing strips attached to the inside of the seams. While this method was fairly satisfactory, it was difficult to hold the backing strips against the joints tightly enough to avoid slag inclusions at the roots of the welds, making repairs frequent and costly.

To overcome this shortcoming, a 10′ boom-and-nozzle assembly was devised to run a first weld pass on the inside of the joint. Then, a second pass was run on the outside in a conventional manner. This eliminated the back-

Fig. 1. Tubular, telescopic adapter, mounted on travel carriage of Lincoln Electric standard automatic welding machine, carries electrode wire to point of welding on inside seam. Support frame is easily removed from carriage.

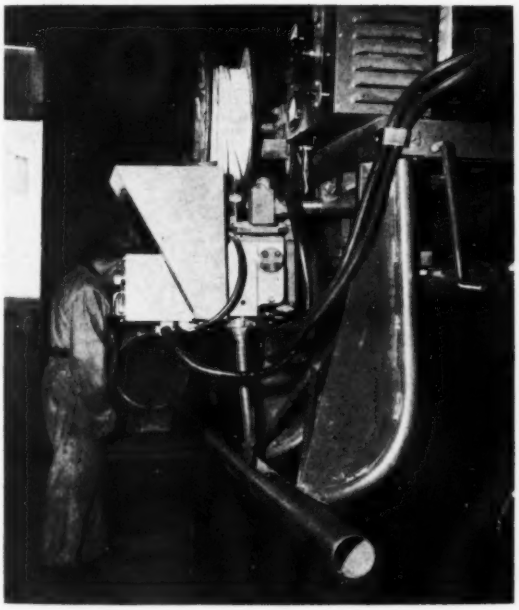


Fig. 2. Closeup of curved nozzle which directs wire to weld. Flux may be dumped over joint initially, or can be blown through adapter tube. This setup has handled diameters down to 4″.

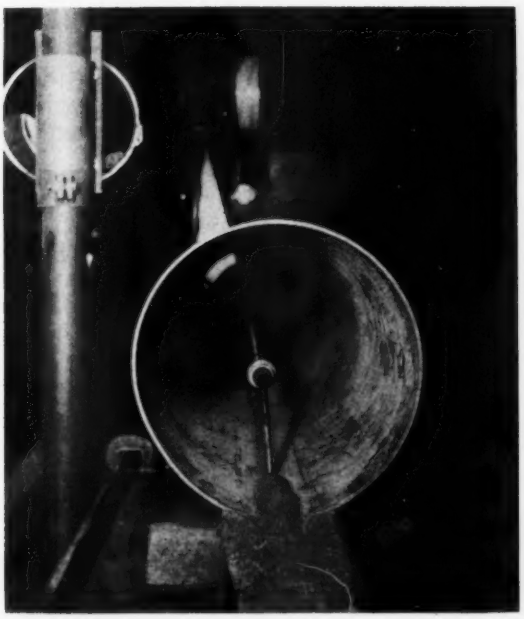


Fig. 3. With adapter removed, the welding head here starts the outside seam, being propelled conventionally by a carriage traveling on the side beam of the welding machine. Cylinder is stainless steel air receiver.

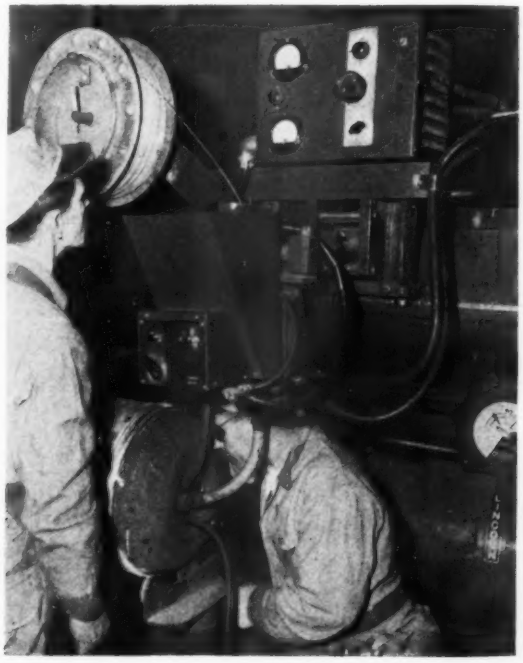
ing strip, and quality improved to the point where virtually no repairs were occasioned.

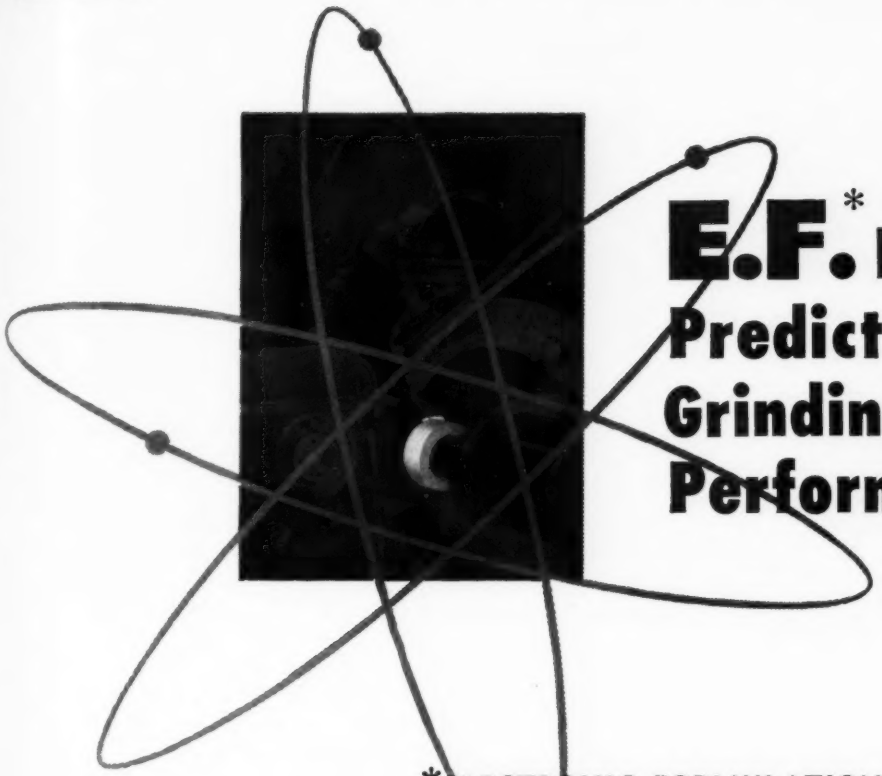
As shown in Figure 1, the tubular boom is carried on two curved pipe sections, reinforced with welded plate webs and mounted on the travel carriage of the welding machine. Electrode wire is fed from the standard Lincoln Electric LAF-2 head into a flexible cable which enters a slot in the longitudinal tube and extends to the far end where it connects with a gooseneck nozzle, Figure 2.

The boom is telescopic in design, starting with a 3″ tube at the rear, stepping down to 1¼″ at the nozzle. The cable carrying the electrode wire is similar to that used on semi-automatic welding units for the Lincoln ML-2 type in which an operator handles the positioning and movement of the welding "gun", remotely from the wire feed. Some alterations were made to fit the head and nozzle to the electrode cable.

Fig. 4. Special type of gooseneck nozzle, tied to flux supply tube, is used to make inside circular seam on the cylinder head. Outer seam is made on second pass, with cylinder being turned under welding head.

Fig. 5. Operator checks position of gooseneck nozzle over inside joint before weld is started. Glass tape is applied over the outside of the joint for a backing strip. X-ray quality, with few rejects, has been maintained.





E.F.* Lets You Predict Grinding Wheel Performance!

***ELECTRONIC FORMULATION** is a new, fundamental manufacturing system. It has established the most accurate standards and techniques by which grinding wheels can be specified, produced, and reproduced. Its new precision applies to all types of grinding wheels as well as to other abrasive products.

Designed and Developed to take full advantage of modern electronic equipment, the "EF" system determines the precise amount of each ingredient. It does this rapidly and flawlessly. The results form a dependable basis for rigid manufacturing control, and are automatically retained on punched cards.

For Your Production Grinding, this means an entirely new degree of dependability, in three important ways. First, original "specs" can be more accurately pin-pointed for your work. Second, "EF" wheels can be more precisely manufactured to match these "specs". Third, replacement wheels can be much more nearly identical in cutting characteristics. "EF" lets you *predict* grinding wheel performance, the key factor in controlling your production grinding to match your production needs.

Ask your local BAY STATE DISTRIBUTOR about these important **"EF"** *advantages.*

BAY STATE ®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.
Branch Offices and Warehouses — Bristol, Conn.; Chicago, Cleveland, Detroit, Pittsburgh. Distributors — All principal cities.
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

CIRCLE INFORM-A-GRAM KEY NO. 91

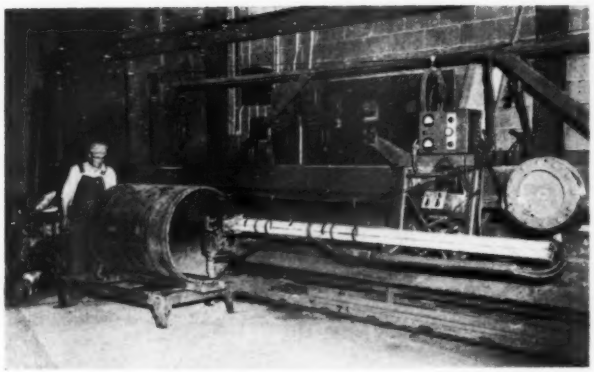


Fig. 6. On larger diameters, the welding head is mounted on the end of the adapter tube, permitting larger diameter electrode wire and higher travel speeds. Support frame for the boom on the carriage is shown clearly.

Flux may be deposited on the joint in several ways. A small hopper can be mounted on the end of the boom, with gravity feed to the arc, or a v-trough the length of the weld can be filled, inserted in the cylinder and dumped over the joint. It is also possible to blow the flux inside the adapter tube and to deposit it at the point of welding as the tube is retracted.

The entire adapter assembly can be installed quickly on any standard travel carriage, and it can be detached easily in a matter of minutes. Thus, the versatility of the welding machine is enhanced appreciably. Diameters down to 4″ have been handled efficiently with the aid of the adapter.

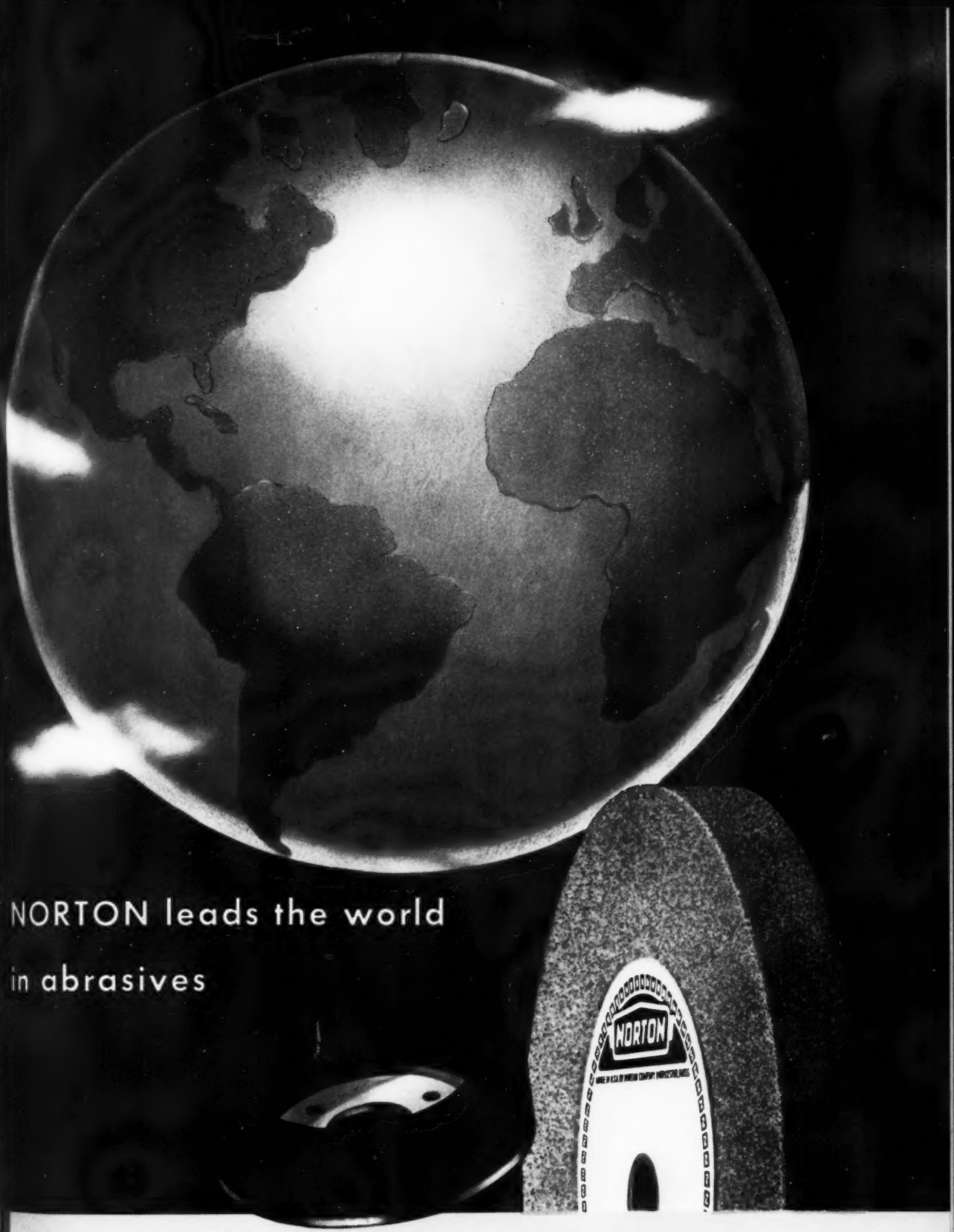
Setup for making the outside longitudinal seam is illustrated in Figure 3, where the travel carriage and head move along the joint at speeds of about 48 ipm. Inside speeds are comparable.

Success attending the use of the boom and nozzle adapter for the longitudinal seams prompted an innovation in welding the circular seam inside the heads of the air receivers. A special type of gooseneck nozzle was designed, shown closeup in Figure 4, which could be slipped inside the head and positioned squarely over the joint. The flux supply hose is wrapped tightly to the electrode nozzle. The operation under way, Figure 5, indicates how the cylinder is rotated slowly after the nozzle has been spotted inside. Glass tape is used as a backing over the outside of the joint during the inside weld. Here again, quality was found to be much improved and reworking cut to a minimum.

In a later adaptation for welding inside seams of such vessels, the entire welding head was mounted on the end of the adapter boom, Figure 6, this arrangement being possible only in the case of larger diameters—20″ or over. It permits the use of larger diameter wire and higher travel speeds in heavy-gauge material.

The part shown is a large pipe fitting handled for the Ladish Company by Automatic Welding Company. Material is high-tensile low-alloy steel, 1⅛″ thick, 34″ dia, and 48″ long. Edge preparation calls for a 90° combined bevel with a ½″ land. A 3/16″ mild steel wire (Lincoln L-70) is used at a current setting of 900-1000 amp, and 35 arc volts. Travel speed on this job is 12-15 ipm. One pass is sufficient, inside and out. Figure 7 is a closeup of the head as it starts the inside seam. Also shown is the trough used to deposit and retain a layer of flux (Lincoln No. 760) over the joint before the weld is started. ΩΩ

Fig. 7. Cylinder of high-tensile steel, 1⅛″ thick and 34″ dia, is welded inside and out with one pass at 12 to 15 ipm. Trough is used to keep flux pile squarely over the joint.



NORTON ABRASIVES

Making better products . . . to make your products better

NORTON BRINGS THE "TOUCH of GOLD" TO GRINDING JOBS THE WORLD OVER

THE TRUE "TOUCH OF GOLD" in grinding can happen only when the grinding wheel — or other abrasive product — is doing the best possible job. That is, when it is saving the most time and money — adding the greatest value to the product being ground — and boosting grinding profits to the maximum. These are the benefits built into all Norton abrasives.

And here are some of the ways in which Norton makes sure you can add the "Touch of Gold" to every grinding job you do . . .

THE BROADEST LINE. Norton offers you the widest choice of abrasive products — available in hundreds of thousands of different grinding combinations, so you will get exactly what you need for best production at lowest cost.

EXACTNORTON PRODUCTS is manufactured to strictest quality control standards. And each is backed by research and development that have produced the greatest number of abrasive advancements in the field. For example: 32 ALUNDUM® abrasive, unequalled for fast, cool cutting action on today's steels . . . C Bond, most efficient vitrified bond ever developed . . . and BORALOX boron carbide, hardest material made by man on a commercial production basis.

YOUR NORTON DISTRIBUTOR is ready to help you on any grinding problem. His factory-trained specialist will see that you get exactly the right wheel for each job. And your Norton Abrasive Engineer is always available for free technical consultation. Take advantage of these application aids to better, more profitable grinding.

FAST SERVICE FROM FULL STOCKS. Norton Distributors, in 208 cities in the U. S. A., maintain stocks fully adequate to the needs of each area. They, in turn are backed-up by warehouse stocks in five major industrial areas, and by the vast stocks in the mile-long Norton plant, serving customers abroad are 12 Norton plants and stores of Distributors.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

NORTON COMPANY, Worcester 6, Mass.

New York • Philadelphia • Pittsburgh • Chicago • Cleveland • Detroit • St. Louis • Hartford • Los Angeles

Distributors in all industrial areas — see your classified telephone directory

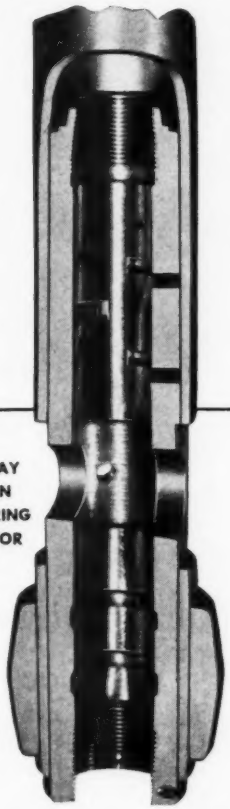
BEHR-MANNING, Troy, N. Y. is a division of Norton Company

Export: NORTON BEHR-MANNING OVERSEAS INC., Worcester, Massachusetts

MICROHONING*

with self-dressing abrasives generates consistent *Functional Surface Finishes*

Microhoning, the low-velocity abrading process consistently produces part after part exactly to your specified surface finish requirements, because the abrasive grits always remain sharp.



CUTAWAY SECTION OF STEERING ACTUATOR

Monroe Auto Equipment Co. designed its power steering unit to withstand rugged use while maintaining sensitive control. In the final processing of the hydraulic steering actuator, Monroe chose Microhoning to obtain diametric accuracy, consistent finish and to generate geometric precision.

The rough and finish Microhoning operations removed .005″ stock from an interrupted bore 1.125″ in diameter and 6⅜″ long.

MATERIAL AND HARDNESS: SAE 1118 steel, Rockwell 45-50C

TOLERANCES: size—.0003″
roundness and taper—.0001″

FINISH: 25 microinches or less

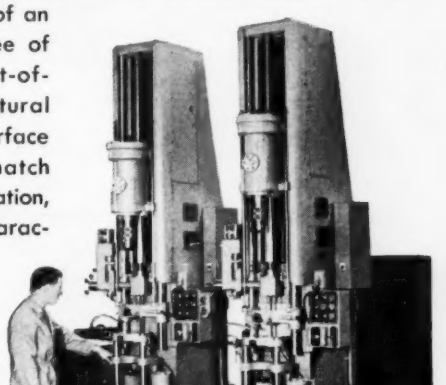
CYCLE: rough Microhoning—35 to 40 seconds
finish Microhoning—15 to 20 seconds

MACHINE: Double-column Model 740 Hydrohoner

SELF DRESSING ACTION OF THE ABRASIVES . . . is accomplished by the rotation and reciprocation of the Microhoning tool—the combined motion continuously changes the direction of force on the abrasive grits and keeps them dressed.

EFFICIENT STOCK REMOVAL . . . results from the many sharp-cutting grits acting simultaneously over a wide area of work surface. In this manner, the effect of heat is also minimized. Of all production processes, Microhoning least disturbs the sub-surface structure of the work.

FUNCTIONAL SURFACE CHARACTERISTICS . . . are obtained in one uninterrupted cycle. Microhoning generates accuracy within millionths of an inch . . . surfaces free of waviness, taper, out-of-roundness and structural stresses . . . uniform surface finish and a cross-hatch pattern for best lubrication, sealing and wear characteristics.



PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

For more details on this application write for CROSS-HATCH Vol. 8, No. 1

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

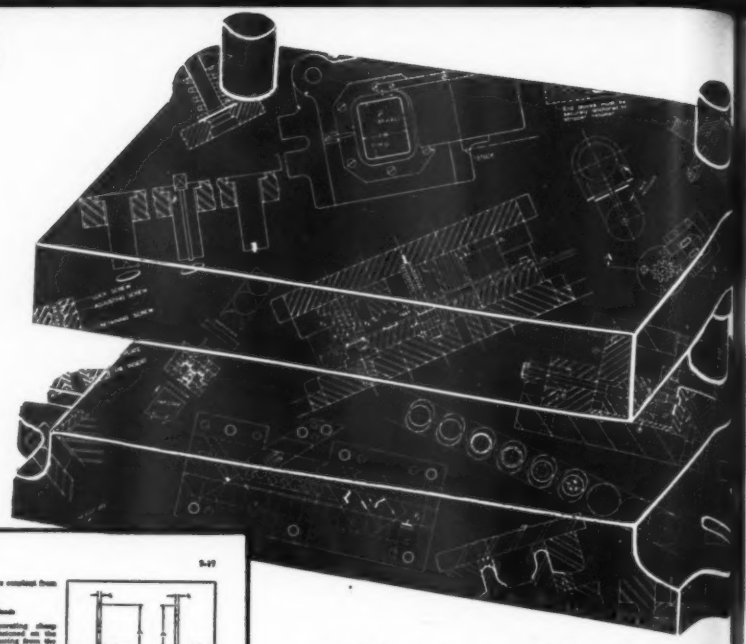
CIRCLE INFORM-A-GRAM KEY NO. 95

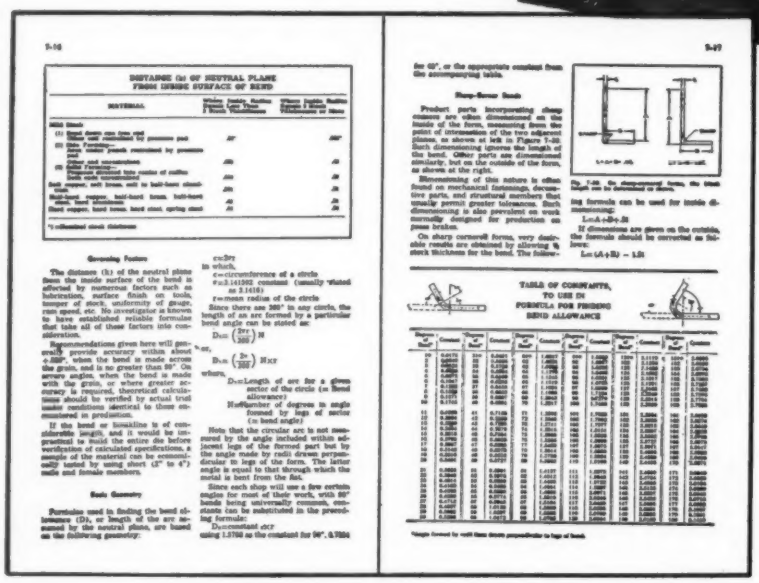
DIE DESIGNING AND ESTIMATING

Fourth Edition

Now Ready!

Copies shipped immediately on receipt of your order.





368 pages, 26 chapters, over 400 illustrations, charts and graphs. 165 Practical Points in Die Design and Construction Comprehensively indexed.

Valuable to the die designer, engineer and die maker as a reference and refresher, and to the student and apprentice in classroom and on-the-job training.

A few of the major subjects covered:

Economical Use of Strip Stock
Step-by-Step Design of the Basic Dies
Short-Run, Lamination and Progressive Dies
Detailed Descriptions of Many Successful Dies
Effective Use of Inclinable Presses
Factors Affecting Perforator Life and Failure
Deep-Drawing Techniques
Blank Development
Time-Unit Values for Estimating Die Costs
Determining Required Press Capacity

Price, $7.50* per copy. Copies will be shipped immediately on receipt of your order.

USE COUPON FOR ORDERING

Huebner Publications, Inc.
1975D Lee Road, Cleveland 18, Ohio
Gentlemen:

Please ship immediately _____ copy (copies) of DIE DESIGNING AND ESTIMATING, Fourth Edition, at $7.50* per copy.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

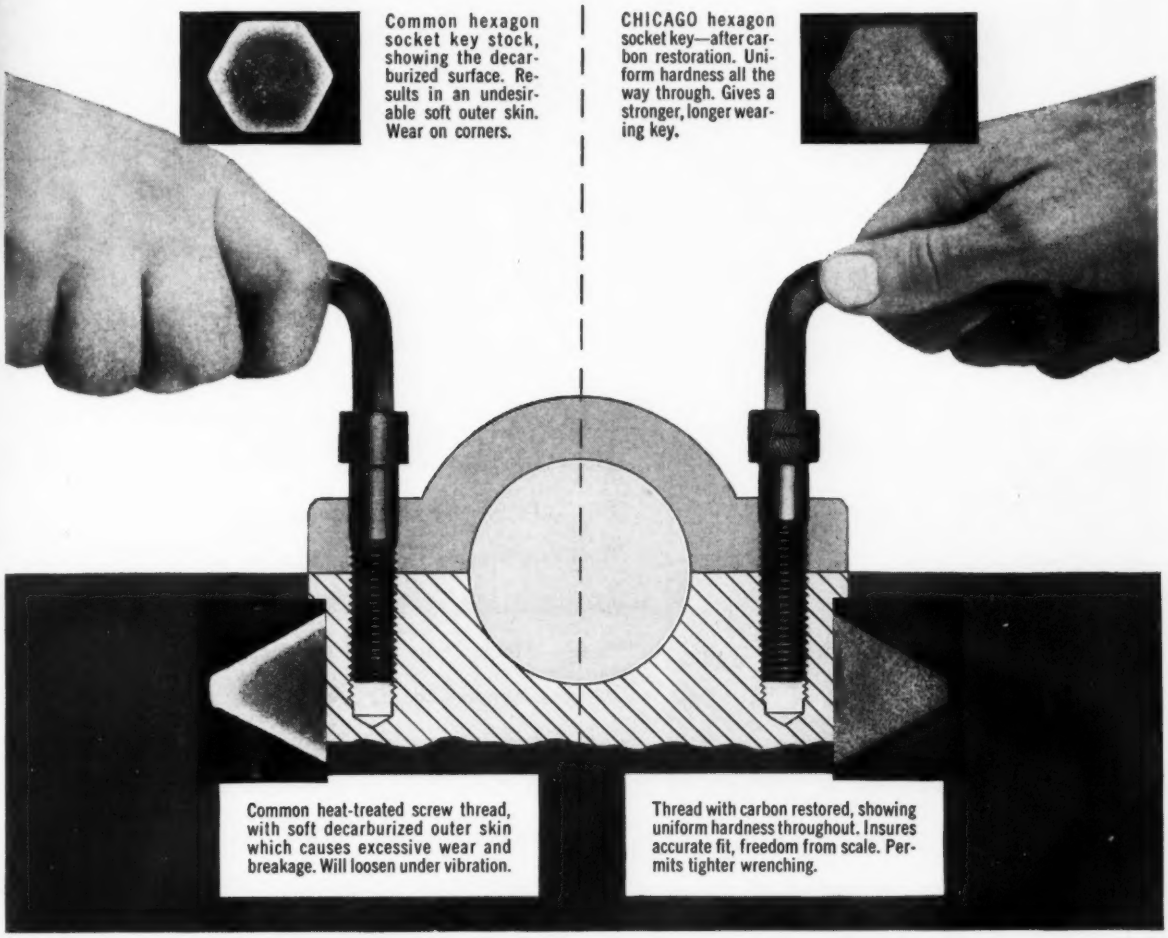
CITY _____ ZONE ____ STATE _____

Open account shipments on purchase orders of rated companies. Otherwise, check must accompany order. No C.O.D.'s, please.

*Ohio customers add 3% sales tax.

How carbon affects fastener performance

Screw fasteners may look identical, but the microscope reveals a wide difference in their ability to "take it"


Common hexagon socket key stock, showing the decarburized surface. Results in an undesirable soft outer skin. Wear on corners.
CHICAGO hexagon socket key—after carbon restoration. Uniform hardness all the way through. Gives a stronger, longer wearing key.
Common heat-treated screw thread, with soft decarburized outer skin which causes excessive wear and breakage. Will loosen under vibration.
Thread with carbon restored, showing uniform hardness throughout. Insures accurate fit, freedom from scale. Permits tighter wrenching.

The ability of a screw fastener to *stay* fastened depends to a great degree on its uniform hardness. And the hardness of steel hinges on the precise amount of carbon in its structure. However, during steel manufacture and processing, vital surface carbon is inevitably lost. As the above photomicrographs show, lack of surface carbon results in a soft outer skin in the finished fastener. Decarburized outer layers are the cause of many fastener problems: thread stripping, fatigue failure, excessive wear, loosening under vibration, soft corners on socket keys that turn off during use.

The soft "decarb" layer is eliminated by the unique *"Carbon Restoration"* process used by The Chicago Screw Company. In this process, surface carbon is replaced during heat treating, producing a fastener that is uniformly hard from core to surface! The amount of carbon restored is precisely controlled to give maximum hardness without excess carbon build-up. The *Carbon Restoration* process also results in bright hardening and freedom from scale.

All CHICAGO "Safety-Plus" Socket Screw Products and heat-treated cap screws have the benefit of *Carbon Restoration* plus complete quality control procedures from raw material to finished fastener. If you would like complete information and catalog, simply write our Standard Products Division.

THE CHICAGO SCREW COMPANY

DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872

2519 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 97

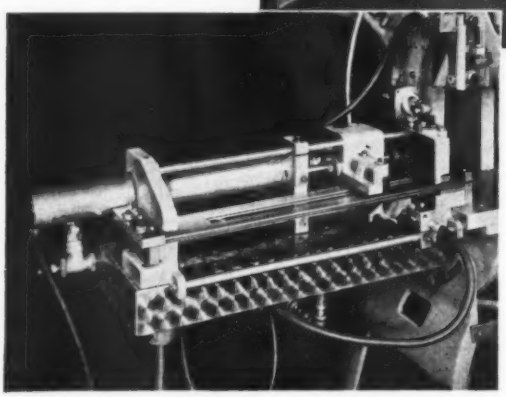
ADDRESS

CITY ZONE STATE

*Ohio customers add 3% sales tax.

EVERYTHING FOR THE PRESS ROOM BUT THE PRESS

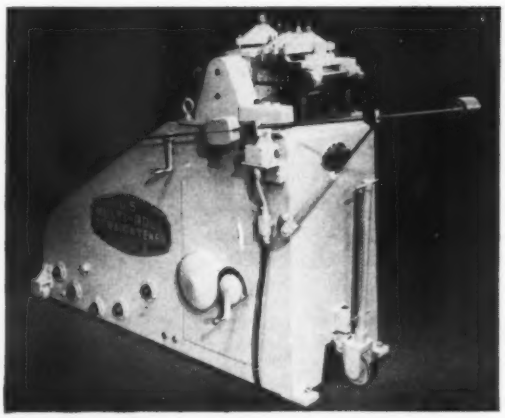
Right: Conventional OBI Punch Press equipped with U.S. Slide Feed with Plain Straightener and U.S. Multi-Roll Cradle.



Above: U.S. Air Operated Slide Feed (no mechanical connections to the press), open side type, suitable for material up to 15" in width and feeding length adjustable up to a maximum of 12" at one stroke. Longer feed lengths obtainable by cycle feeding with counter.

Reduction of costs is a primary concern of all manufacturers. Units included in the line of U.S. Automatic Press Room Equipment such as U.S. Slide Feeds, Roll Feeds, Stock Reels, Coil Cradles, Stock Oilers and Wipers, Scrap Choppers, are designed and built with the aim of converting the punch press into an automatic machine. The end results are increased production, reduced scrap, reduced operator fatigue, reduced material handling and overall reduced costs.

If you use presses in your production processes, ask for copies of Bulletins 80-P and 95-P.



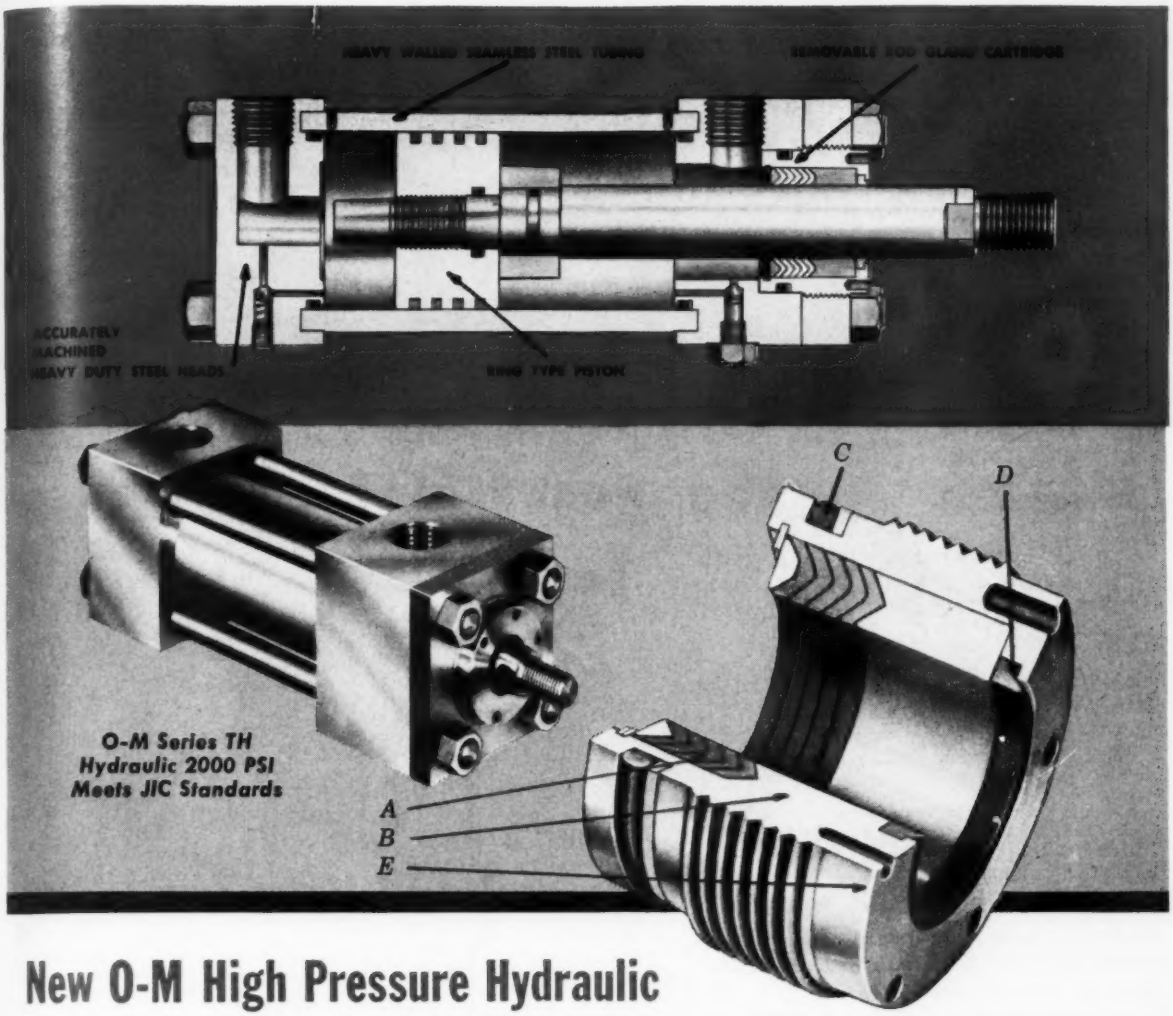
Left: Model PDSC-940 U.S. Combination Coil Cradle and Power Driven Straightener suitable for material up to 9" in width and coils with O.D. up to 40", weight capacity 1,500 lbs.

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 98



New O-M High Pressure Hydraulic Cylinder equipped with Removable Rod Gland Cartridge

The O-M-engineered removable Rod Gland Cartridge, exclusive with the O-M Series TH Hydraulic Cylinders, incorporates all the features essential to peak performance and minimum maintenance. It is constructed with a heavy wall steel shell threaded for quick, easy removal, and accurately piloted in rod head to assure perfect alignment. In most applications cartridge can be removed easily without removing mounts or the rod nuts. You simply loosen and remove with a spanner wrench.

A ***Rod Packing*** — Vee type, non-adjustable, self-compensating, rod gland packing provides multiple lip seal with excellent pressure sensitivity and long life.

B ***Rod Bearing*** — Extra long, bronze rod bearing provides large bearing surface located well forward for maximum support of piston rod.

C ***Cartridge "O" Ring Seal*** — With leather back-up washer provides positive seal and acts as friction lock to retain cartridge.

D ***Rod Wiper*** — Homogeneous lip type located well forward to prevent accumulation of dirt in pocket. Metallic scraper (AN approved) available and interchangeable with wiper.

E ***Pilot*** — O.D. of cartridge serves as pilot for cylinders mounted on rod end.

O-M Series TH High Pressure Hydraulic (oil) Cylinders — conservatively rated at 2000 P.S.I. — are available in bore sizes 1½ to 8-inch inclusive. Descriptive drawings of cylinder, mounts, mounting brackets and capacity chart are included in the new O-M Bulletin 105. Mail coupon for your FREE copy today.

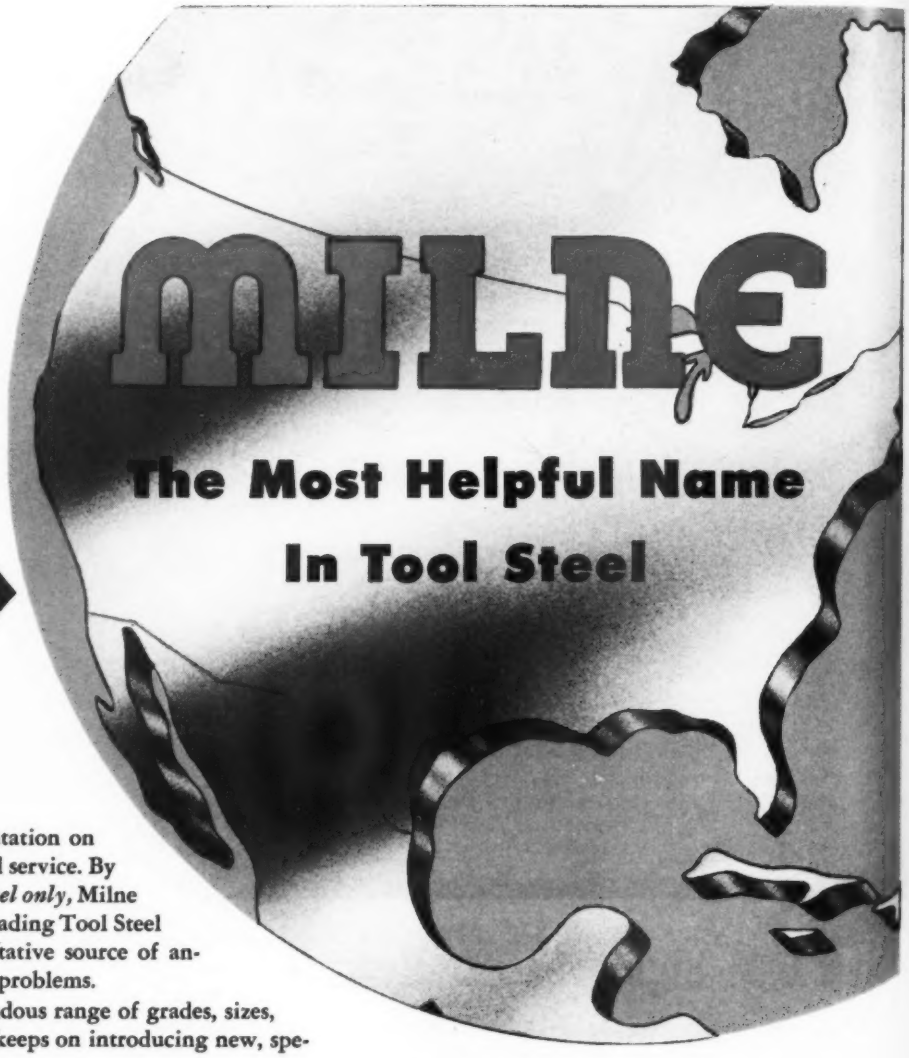
ENGINEERING SERVICE — consult an Ortman-Miller representative regarding your hydraulic or pneumatic problems. His broad experience with standard and special cylinder applications is available to you without obligation. Use convenient coupon.

ORTMAN-MILLER MACHINE COMPANY
21 143rd Street, Hammond, Indiana

☐ Have representative call. ☐ Send Bulletin 105.

Name_____ Position_____
Company_____
Address_____
City_____ Zone____ State_____

Across North America



Milne has built its reputation on *tool steel* knowledge and service. By concentrating on *tool steel only*, Milne has become America's Leading Tool Steel Specialist . . . an authoritative source of answers to your tool steel problems.

- Milne stocks a tremendous range of grades, sizes, shapes and finishes and keeps on introducing new, specialized steels.
- Every Milne sales-engineer is an experienced expert who can help pin-point the right steel for the job.
- From experience, Milne knows the importance of "Rush Delivery" on a tool steel order, whether it's in pounds or tons.
- Milne's continent-wide network of warehouses, sales offices and representatives puts a Milne expert and a Milne stock near you.
- All Milne steels are full length Kolorkoted for permanent identification.

Write or call for Milne's latest Tool Steel Selector Chart.

WAREHOUSES

New York • Chicago • Boston • New Britain, Conn. • Philadelphia • Pittsburgh • Cleveland • Dayton • San Francisco • Atlanta • Detroit • Seattle

SALES OFFICES

Rochester • St. Louis • Bridgeport • Louisville • Worcester • Milwaukee • Birmingham • Madeira Beach, Fla.

SALES AGENTS

Taywood Steel Products	Bell, Los Angeles
Pacific Machinery & Tool Steel Co.	Portland, Oregon
Maxwell Steel Co., Inc.	Fort Worth, Texas
Geoffroy-Lane, Inc.	Denver
Sanderson-Newbold Ltd.	Montreal—Toronto

A MILNE & CO.
745 WASHINGTON ST. NEW YORK 14, N.Y.

Complete Line of Tool Steels . . . Solid • Hollow • Flat Ground

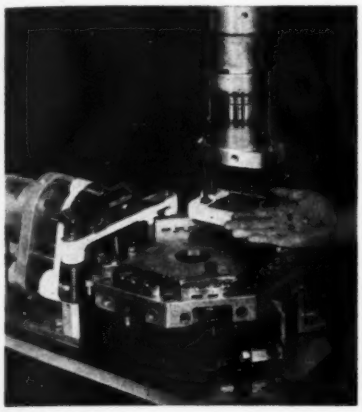
Wide range of grades and sizes in
- WATER HARDENING • NON DEFORMING
- SHOCK RESISTING • GRAPHITIC
- HOT WORK AND HIGH SPEED • TOOL STEELS

CIRCLE INFORM-A-GRAM KEY NO. 100

DRILLING SMALL HOLES IN VERY SMALL PIECES

A small component of a navy fuse, called a detent, is roughly the size of a fingernail and has to have two small holes drilled through the top and one through the side.

To perform this job, Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, built a special but inexpensive eight-station rotary table that facilitates the use of standard drilling and reaming heads. Two gearless multiple-spindle drill heads are used: one vertically mounted to ream two holes, and one horizontally mounted to drill a hole in the side of the detent.



Three pieces are held in each of eight stations, and the holes are drilled simultaneously in three pieces. The two holes through the part are on 5/16" centers and are 1/16" and 3/32" in dia. The side hole, a No. 55 (0.052) dia. drill through a 1/16" section, is drilled from another station at the same time.

Six stations are always open for loading, cleaning, and unloading. Loading is manual. Progressive indexing and ejection are automatic. Production is rated at 1200 pcs/hr.

DREAMING OF A . . .

. . . luxury trip to Paris, Hawaii, the Caribbean, or the Canadian Rockies? A seven-day vacation to one of those scenic places could be yours for telling Jones & Lamson Machine Company which of their machines or machine features could, or does, help you most, and why.

Two seven-day all-expense trips for two to Bermuda and a raft of home workshop power tools will go to 15 second, third, and fourth-place winners.

Jones & Lamson Machine Company, 519 Clinton St., Springfield, Mass., will supply entry forms and information.

TECHNICAL BOOKS

DIE DESIGNING AND ESTIMATING *Fourth Edition*

368 pages, 26 chapters, and over 400 illustrations, drawings, charts and graphs. Extensively revised and enlarged plus a special section of 165 Practical Points in Die Design and Construction. Completely indexed. IMMEDIATE DELIVERY. $7.50 per copy

MICROSTRUCTURES OF DIAMOND SURFACES
by S. Tolansky

11 chapters of original research in the field of diamond growth. New optical techniques explained and illustrated which enable height or depth features as small as one twenty-five millionth of an inch to be resolved and magnifications in depth of half a million times to be made. 143 special art plates. $8.50 per copy

DIAMOND TOOLS *by Paul Grodzinski*

A 379-page handbook on the industrial use of diamonds. Case histories and illustrations describe those applications in which the diamond has proved the most satisfactory tool in performance, precision and economy. $4.50 per copy

DIAMOND TECHNOLOGY *by Paul Grodzinski*

The only standard work on the subject and the only book of its kind in technical literature. 784 pages, 93 working tables, and over 486 photographs and drawings. $10.00 per copy

GEARS for Small Mechanisms *by W. O. Davis*

20 chapters, profusely illustrated covering everything from The Theory and Practice of the Design of Very Small Gears to The Design of Tools for Cutting and Generating Gear Tooth Forms. $5.00 per copy

TREATISE ON MILLING AND MILLING MACHINES
by The Cincinnati Milling Machine Co.

Gives you the answer to practically every metalworking problem in the field of milling from the toolroom to fixture design and high production milling. 896 pages, over 200 formulas and 700 illustrations and charts. $8.00 per copy

KNOW-HOW LIBRARY SERIES

COLD FORMING OF THE STAINLESS STEELS
by Lester F. Spencer

28 pages of KNOW-HOW on the blanking, punching, perforating, and bending, forming, deep drawing and spinning of the stainless steels. $1.00 per copy

MACHINING, HEAT TREATMENT & PICKLING OF THE STAINLESS STEELS
by Lester F. Spencer

36 pages on the working of stainless — including drilling, tapping, threading, reaming, skiving, milling, broaching and shaving, plus heating and quenching procedures. $1.50 per copy

HUEBNER PUBLICATIONS, INC., 1975 Lee Road, Cleveland 18, O.

Gentlemen: please send me at once:

_____Microstructures .....$ 8.50* each
_____Diamond Tools .....$ 4.50* each
_____Diamond Technology ....$10.00* each
_____Gears .....$ 5.00* each
_____Die Designing and Estimating .....$7.50* each
_____Treatise on Milling .....$8.00* each
_____Cold Forming of the Stainless Steels .....$1.00* each
_____Machining, Heat Treatment & Pickling of the Stainless Steels .....$1.50* each

NAME_____TITLE_____
COMPANY_____
STREET_____
CITY_____ZONE_____STATE_____

Open account shipments on company purchase orders. Otherwise check with order, please. No C.O.D.'s please. *Ohio customers add 3% sales tax.

. . . *and* THIS CHECK
is valuable too!

TRI-ROLL
THREAD
Comparators

produced
ONLY *by*

PRATT & WHITNEY

When it comes to checking external threads, a P&W Tri-Roll Thread Comparator can save valuable time and increase your profit margin by reducing inspection costs. But fast, easy operation is only part of the story. *Only* Tri-Roll gives you a complete, visual analysis of lead, angle and pitch in one operation . . . *plus* a direct reading of out-of-roundness by rotating the work. *Only* Tri-Roll offers an alternate, critical check of pitch diameter by using two-rib rolls. And ONLY PRATT & WHITNEY can offer you Tri-Roll Thread Comparators with all their advantages of dependability and economy.

SEND NOW FOR COMPLETE INFORMATION – WRITE FOR YOUR FREE COPY OF CIRCULAR NO. 570
(It's fully illustrated, of course.)

PRATT & WHITNEY COMPANY
INCORPORATED
15 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities

MACHINE TOOLS • GAGES • CUTTING TOOLS

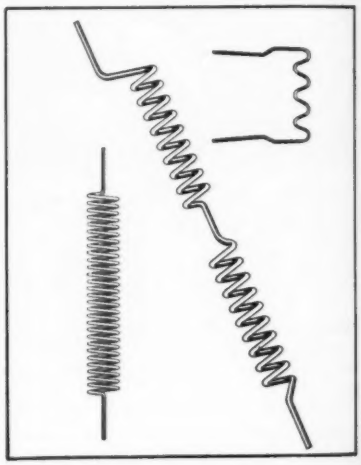
How to Work Tungsten

by J. M. White
FANSTEEL METALLURGICAL CORPORATION
North Chicago, Illinois

WITH PROPERLY DEVELOPED SKILLS AND PROCEDURES, tungsten can be fabricated into a surprising number of forms. Compared with other metals having body-centered cubic lattice, its ductility and malleability are rather low. Inherently, it is a somewhat brittle metal at room temperatures, and the danger of cracking or breaking the metal must always be kept in mind.

Forming

Except for simple forming of fine wire in sizes up to 0.030" dia, tungsten should not be worked cold. Sheet up to 0.010" thick or wire to 0.010" dia can be formed at a temperature of about 200°F (95°C). Up to 0.015", the metal should be heated to 400° to 500°F (200° to 260°C). Tools and dies should also be heated. When



Examples of how tungsten wire may be formed. These are heating elements for vapor deposition.

forming material between 0.015" and 0.040" thick, the temperature should be increased to 1000°F (540°C). Thicker metal should be heated to 2400° to 3000°F (1315° to 1645°C). Failure to heat tungsten to the proper temperature will almost invariably result in fracture of the metal.

Tungsten can be heated to temperatures up to 350°F on a gas or electric hot plate without too much danger of oxidation, although thin sheet or fine wire should not be exposed to air at these temperatures for too long a time. When higher temperatures are required, tungsten

*Tantung is made by the Vascoloy-Ramet Corporation, a Fansteel subsidiary located in Waukegan, Illinois. Tungsten carbide dies are also available from Vascoloy-Ramet.

MOORE SPECIAL TOOL COMPANY

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

New 424-page Book Tells How You Can Produce Tools, Dies, Precision Parts the Modern Way...

"Holes, Contours and Surfaces" Just Published

EXCLUSIVE...184 pages of Woodworth Hole Location Tables

"HC&S" includes a 184-page section of Woodworth Circular Tables which greatly simplify calculating rectangular coordinates for locating hole centers on a circular layout. There is a table for each pattern of holes, 3 to 100 inclusive. Unavailable elsewhere, these tables alone are worth more than the price of the book.

495 Photos and Drawings

"HC&S" features a multitude of close-up instructional photographs, working drawings and charts placed adjacent to text so that it can be followed photographically.

"Holes, Contours and Surfaces," just published by Moore, is the first comprehensive book that gives all the answers to metalworking's toughest problem: *the accurate locating and machining of holes, contours and surfaces.* It covers the many major developments in the field since 1946 when Moore's first book, "Precision Hole Location," was published. That book was so well received that it became a technical best-seller and is now out of print.

While "PHL" dealt only with jig boring and jig grinding of holes, this new, 424-page volume describes subsequent hole-location developments, covers contours and surfaces, and introduces the subject of linear form grinding. "HC&S" is a must for every toolmaker, jig borer operator, jig grinder operator, machinist, tool engineer, production engineer, machine buyer, machine builder, production executive, product designer, apprentice and student.

"HC&S Fills Urgent Need" ....Burnham Finney

Here's what Burnham Finney, distinguished editor of *American Machinist*, says about "HC&S": "Outstanding for its clarity of expression, its technical accuracy...fills an urgent need and should live long on the bookshelves and work benches of the American Metalworking Industry."

14 Fact-Filled Chapters

1. The Problem of Location
2. Improvised Location Equipment & Methods
3. The Foundation of Accuracy
4. Engineered Location Equipment Standards
5. The Coordinate Locating System
6. Jig Boring Principles & Applications
7. Jig Boring Practices
8. Jig Grinding Principles & Applications
9. Jig Grinding Holes
10. Jig Grinding Contours
11. Linear Form Grinding Principles & Applications
12. Linear Form Grinding Practices
13. Inspection Methods
14. Precision Pays Dividends

PLUS a 184-page section of Woodworth Circular Tables

Only $5 in U. S. A., $6 Elsewhere...For your copy, send Check or Money Order with this coupon Today

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut

Enclosed is $..... for ..... copies of "Holes, Contours and Surfaces." (No C.O.D.'s or Purchase Orders, please.)

NAME.....

ADDRESS.....

CITY..... ZONE..... STATE.....

CIRCLE INFORM-A-GRAM KEY NO. 103

All Tool Steel Looks The Same

The Difference Shows Up Later!

PRK-33 — Air Hardening, Non-Deforming Cobalt, High-Carbon, High Chrome. For high production blanking, forming, drawing, trimming and shearing.

NEOR — The original Oil Hardening, Non-Deforming High Carbon, High Chrome. Recognized as the ideal lamination die steel. Also suitable for other long run dies.

MINEOR — 5% Chrome, Air Hardening, Non-Deforming. Has many desirable features of more expensive air hardening steels. Tough at high hardness.

OHT — Oil Hardening, Non-Deforming. Excellent machineability, minimum distortion, good resistance to wear. An economical steel for short run dies.

"MT6" — The Standard "M2 Type", High Speed Steel. Designed for a superior tool and at the same time save critical alloys.

And that difference often means money and time wasted. Judge Darwin tool steels solely on performance—how others have profited by its use—by thorough trial in your own plant. Darwin tool steels, used as recommended by our engineers, outperforms and is a better steel for the money than you will buy elsewhere. Call or write today, we'll be glad to help solve any tool steel problems.

Furnished in bar stock, billet, forging, sand casting. Drill rod, flat ground stock, tool bits. Bulletin on Request.

DARWIN & MILNER Inc.

highest grade tool steels

2345 ST. CLAIR AVENUE ★ CLEVELAND 14, OHIO

• 1610 W. FIRST AVENUE • COLUMBUS, OHIO •

REPRESENTED BY

ZIV STEEL & WIRE CO., CHICAGO • DETROIT • ST. LOUIS • INDIANAPOLIS • TOLEDO • MILWAUKEE • M. G. OPP COMPANY, NEW YORK CITY • PECK STEEL & DIE SUPPLY COMPANY, LOS ANGELES • CHARLES B. WEBSTER, PLAINVILLE, CONNECTICUT • CHARLES W. BRINGMAN, ORLANDO, FLORIDA

CIRCLE INFORM-A-GRAM KEY NO. 104

should be heated in hydrogen or dissociated ammonia.

Punching or Shearing

The heating recommendations for forming tungsten apply when punching or shearing the metal. Sheet of 0.050" and thicker should not be sheared to finish dimensions, but should be sheared to within 1/16" to 1/8" of desired dimensions, then edge ground (see grinding and cutting). Tungsten over 0.050" has a tendency to laminate when being punched or sheared, and the above procedure will enable any laminated edges to be removed.

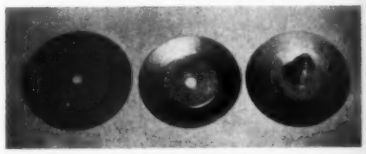
Very sharp punches, dies and shear blades will help to prevent the tungsten sheet from laminating or cracking.

For very thin stock and small diameters not exceeding 1/4", tungsten carbide dies can be used. For other work, dies and punches of Tantung* are recommended. Steel dies are not satisfactory for punching tungsten.

Grinding and Cutting

Although tungsten has been machined with very hard cemented carbide or diamond tipped tools, machining is not generally recommended. For any finishing or cutting operations the use of abrasive wheels is recommended.

In grinding tungsten, extreme care must be exercised to avoid localized heating, chipping and cracking. For surface, cylindrical or offhand grinding, light presure, constant motion of the work, and the use of plenty of coolant is recommended.



Three stages of fabricating tungsten into an X-ray target: blank, form and assembly.

Silicon carbide wheels are considered best for all types of grinding as they are relatively soft and wear down readily, which helps prevent heat checking. The wheel speeds recommended by wheel manufacturers are suitable for grinding tungsten. The desired finish will dictate the fineness of the grit. A 60-grit wheel, such as Norton No. 3760, is suitable for most grinding. Finer grits may be used for finer finishes, but wheels of a grit finer than 80 tend to load rapidly, which enhances the danger of heat checks.

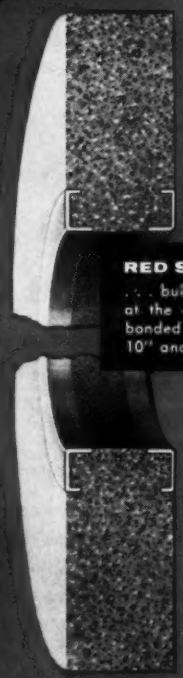
The best method of cutting tungsten is with an abrasive wheel. Attempts to cut rod or wire with shears or pliers almost invariably result in cracks which may travel for several inches in the material. Subsequent attempts to grind out these cracks usually make them worse. Wheels

SIMONDS
ABRASIVE CO.

GRINDING WHEELS... with *improved bushings* for better grinding

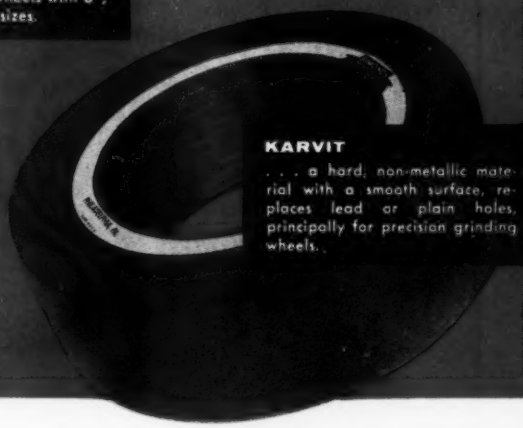
TRUFIT
. . . a resin-impregnated fiber sleeve in the center hole, principally for resinoid bonded wheels for portable grinders.

POLYSTYRENE
. . . injection molded plastic material replacing conventional lead bushing, chiefly for tool room wheels such as 7 x ½ x 1¼.



RED STREAK FLANGES
. . . built-in circular steel flanges at the center hole. For resinoid bonded snagging wheels with 6", 10" and 12" hole sizes.

STEEL INSERTS
. . . threaded or plain, in sizes to fit all portable grinders, including straight wheels, cup wheels and cones.



KARVIT
. . . a hard, non-metallic material with a smooth surface, replaces lead or plain holes, principally for precision grinding wheels.

Better, more economical grinding! Simonds literally "centers" on this with these improved bushings. For you, this means better grinding efficiency . . . in terms of better spindle fit, better balance, truer running, less wear on spindles and center mounts and better work produced.

Put all these advantages to work for you by specifying Simonds Abrasive Co. Wheels on all your grinding jobs.

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

For highest precision . . .

completely independent of operators' skills

push button controlled

ABA OPTICAL JIG BORER

Type VL 600

with

AUTOMATIC POSITIONING

And working accuracy of .0002″

- Direct reading accuracy of 50 millionths
- No gauge blocks or measuring rods needed
- No dependency on accuracy of lead screws

The ABA Optical Jig Borer handles fine jig boring and facing operations with unfailing accuracy. Automatic controls plus direct readings in the millionths remove chance of error and the finished work meets the strictest requirements.

Because of its outstanding performance, the ABA is used more and more today for production work in leading plants throughout the United States. For complete proposal and specifications, write today to Dept. TP.

PARTIAL SPECIFICATIONS

Working surface	16″ x 27¾″
Table traverse	17″ x 26″
Table to spindle, max.	24½″
Quill travel	8⅝″

COLUMBIA INTERNATIONAL CORP.

Importers of Fine Machine Tools

10-35 44th Drive, Long Island City 1, N. Y.
Telephone: STillwell 4-1546

CIRCLE INFORM-A-GRAM KEY NO. 106

similar to Allison No. 15540 are recommended. The thickness of the wheel may be varied in proportion to that of the work. In cutting heavy bar or rod stock above ¼″ thick, the wheel thickness should be about 0.040″. For lighter material the wheel thickness can be reduced to as low as 0.025″, and if very close tolerances are to be maintained and the operator is sufficiently skilled to avoid wheel breakage, a wheel 0.015″ or 0.010″ thick can be used.

Forging

Tungsten can be forged in a manner similar to other metals, although it must first be heated in an inert atmosphere of either hydrogen or dissociated ammonia. The recommended temperature for forging is about 2912°F (1600°C).

How and Why of Training is Topic of Conference

Increased specialization, mechanization, and automation all call for increased cultivation of technical skills within industry. The American Society of Training Directors, through its four Institute sessions this summer at the University of Wisconsin offers training directors an opportunity to learn the latest principles and techniques for making their programs more effective and valuable.

The many facets of the director's job will be discussed at Unit I, July 9-13, with emphasis on training's place and needs, instructors, and training program administration.

Planning and conducting specific programs are to be handled in Unit III, also scheduled for July 9-13. Various phases involved in planning and conducting a specific program will be discussed and practiced in these areas: employee and supervisory training, management development, technical training, and creative thinking.

The July 16-20 sessions of Unit II will center on training methods. The psychology of learning, workshops, and choice of method of training are to be featured.

The trainer's professional development and notes on how to administer training programs will fill the agenda of Unit IV, scheduled for July 16-20.

Milton Hanson, Director of Training at Abbott Laboratories, and Norman Allister, Director of the Industrial Management Institute at the University of Wisconsin, are co-chairmen of the Institute. Applications and program information are available from the American Society of Training Directors, 2020 University Ave., Madison, Wis.

Why the Die Maker Prefers PRODUCTO Die Sets

Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

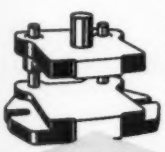
*Patent Pending

He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut



PRODUCTO

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

CIRCLE INFORM-A-GRAM KEY NO. 107

ENTER
JONES & LAMSON'S NEW HORIZONS CONTEST

WIN a 2-weeks LUXURY VACATION FOR TWO!

Grand Prize:

Two-Weeks Luxury Vacation Trip for Two, All Expenses Paid, to a choice of one of the following:

PARIS
THE CARIBBEAN
CANADIAN ROCKIES
HAWAII Plus $400 for spending money, baby sitter fee, etc.

Two 2nd Prizes: Each a Seven-Day All-Expenses-Paid Luxury Vacation for Two to Bermuda. Plus $200 spending money.

Three 3rd Prizes: Each a Shopmaster Combination Saw-Jointer Power Tool, complete with motor.

Ten 4th Prizes: Each a Shopmaster Individual Single-Purpose Power Tool (A Choice of Saw, Drill Press, Jointer, etc.)

Contest is open to all persons, residing in the continental U. S. A., engaged in metalworking or allied industries, except employees of Jones & Lamson Machine Company, its selling agents and its advertising agency, and members of their families.

Contestants merely answer, in 150 words or less, the question "Which Jones & Lamson Machine, or Machine Feature, could, or does, help you most, and Why?"

When you write in (use coupon or not, as you wish), we will send you an official entry form, together with information upon which to base your answer.

JONES & LAMSON

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

JONES & LAMSON MACHINE COMPANY
519 Clinton Street, Springfield, Vermont

Please send official NEW HORIZONS CONTEST entry form and information to:

*Name*_____

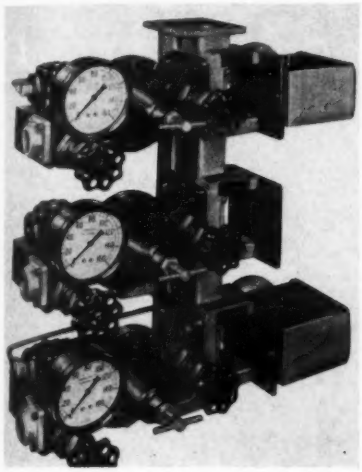
*Address*_____

*City*_____ *Zone*_____ *State*_____

CIRCLE INFORM-A-GRAM KEY NO. 108

PACKAGED AIR UNIT SIMPLIFIES PRESS INSTALLATION

An air manifold has been developed which provides a simple and efficient means of regulating air supply to press clutch and brake units, counterbalance cylinders, and die cushions. All the valves, regulators, air gauges, and switches necessary to operate these units have been combined into a compact package. As a result, the elaborate and laborious job of assembling this type of control from standard valves and fittings has been eliminated.



Developed by the Clearing Machine Corporation, Division of U. S. Industries, Inc., Chicago 38, all of the devices to regulate a supply of air have been grouped into a single composite air valve. The elements of the composite valve include a shut-off valve, pressure regulator, pressure gauge with needle throttle valve, check valve, and exhaust valve.

These components are mounted on a cast housing, so that there is no intermediate piping to be done between parts.

A unique header has also been developed which brings together into one package as many composite air valves and pressure switches as are required for a complete press control. These headers provide flanges for mounting both air valve and air pressure switches. The headers are designed so that when the air manifold is bolted to the header, connections are made to both the air inlet and the exhaust simultaneously.

Your Inform-A-Gram Card is on Page 110.1

The part at the top is a stamping used in a product for the telephone industry. As you can see it is drawn with heavy score marks on the vertical portions. These marks formerly had to be completely buffed out before finishing. Of course, this was costly work.

Realizing the problem, Laystrom suggested the use of a special alloy steel die which would cost more to make. The results show up in the lower photo, an unretouched picture of the resulting part. Galling and scoring are completely eliminated and the customer only requires a touch up buff before finishing. Added to this, the maintenance on the die takes less than half the time it did before. More pieces before grinding die mean better production, cutting unit costs significantly.

Here is a case of a *better* stamping being a lot less expensive if the overall production picture is analyzed thoroughly. Laystrom is helping many people make vital savings at the same time they are making better products. We'll be glad to work with you, too.

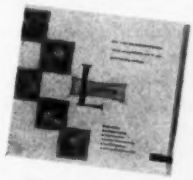
Laystrom

TOOLS • DIES • ASSEMBLIES • PARTS DESIGN • SHORT-RUN DUPLICATING
PRECISION MACHINING OF MEDIUM SIZE STAMPINGS AND CASTINGS

LAYSTROM MANUFACTURING COMPANY
2005 North Parkside, Chicago 39, Illinois

• Please send us complete brochure covering Laystrom production services to industry.

Name_____
Title_____
Company_____
Address_____
City_____ State_____



☐ We are sending drawings for quotation. ☐ Have salesman call. ☐ Send brochure only.

CIRCLE INFORM-A-GRAM KEY NO. 109

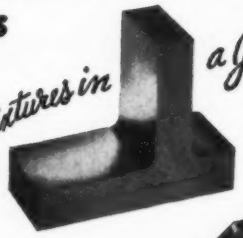
NOBLE & STANTON *Standards* FINEST QUALITY

JIG and FIXTURE COMPONENTS

Complete Line—Over 500 Parts

"T" ANGLE PLATES

Fixtures in a Jiffy!

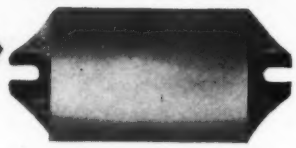


Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized and precision machine castings. Full scale sheets of 7 standard sizes will be included with your catalog if requested.

BOX JIGS

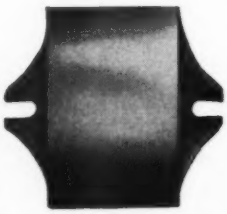
Box Jigs shown are made in either square or rectangular style in 9 sizes. Have them on hand in several sizes, use them, and watch your profits mount.

MILL FIXTURE BASES



The Mill Fixture Base shown on top is available in four sizes, the Gang Mill Fixture Base in three. Both are furnished with either standard keyways or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost. These normalized bases are precision ground, parallel top and bottom with one side finished parallel to the keyways, eliminating the delay and expense necessary in obtaining patterns, castings, normalizing and machining. Ask for full scale template drawings in your size range.

Sure Lock Fixture Keys See Page 41 of our Template Catalog



WRITE FOR FREE CATALOG

Our complete line of highest quality jig and fixture parts is shown in our new catalog. They are stocked for quick delivery from Dealers coast-to-coast. Write for your copy today!

STANDARD PARTS CO.
MANUFACTURERS OF GENUINE NOBLE & STANTON PARTS
1002 BROADWAY • BEDFORD, OHIO • BEDFORD 2-800

CIRCLE INFORM-A-GRAM KEY NO. 1101

SPECIAL PRECISION PARTS

IN QUANTITIES—AT REASONABLE PRICES

Do you need special interchangeable tool parts, precision-made to your specifications, in quantities from 6 to 100 pieces or more? The automotive and aircraft industries have used us for years for this type of work. At present a number of large automated plants depend upon us for special, precision-made parts at reasonable prices. We are especially qualified to meet your automation parts requirements. Our prices, quality and delivery will more than please you. Send your prints for prompt quotations.

STANDARD PARTS CO.
1002 BROADWAY • BEDFORD, OHIO

FOR FAST ACTION — Phone: BEdford 2-2800

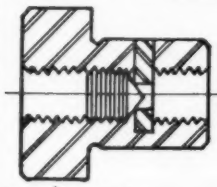
CIRCLE INFORM-A-GRAM KEY NO. 1102

NOBLE & STANTON *Standard* JIG & FIXTURE COMPONENTS

Just a Few of the Many

NEW ITEMS

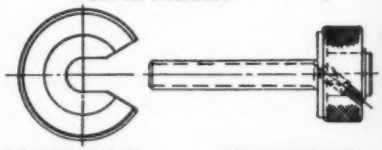
in our Line of 500 Components



SURE LOCK FIXTURE KEYS

DOUBLE CAM LEVERS

FLAT NOSE HEEL CLAMPS
Soft for Alteration



EQUALIZING "C" WASHERS

ADJUSTABLE TORQUE SCREWS

FINEST QUALITY STANDARDS For Your Tooling Program

Hundreds of time-saving, money-saving components shown in our

NEW CATALOG
66 PAGES FREE!

Write for your copy!
Tracing sheets available for every part

STANDARD PARTS CO.
1002 BROADWAY • BEDFORD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1103

INFORM-A-GRAM — JUNE, 1956 ISSUE

DO NOT USE THIS CARD AFTER AUG. 31, 1956

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.)

ADVERTISEMENTS

1	19	38	62	111	135	186	1162	1824	1783	1841	1902	1941	1982	2041	2091
2	21	42	64	113	136	160	1163	1841	1791	1842	1903	1942	1983	2042	2092
3	22	43	65	114	137	162	1164	1842	1792	1851	1904	1943	1984	2043	2093
4	23	44	91	115	138	163	1181	1843	1793	1852	1905	1944	1991	2051	2094
5	24	45	94	117	139	164	1192	1844	1801	1853	1911	1951	1992	2052	
6	25	46	95	118	140	165	1193	1871	1802	1861	1912	1952	1993	2053	
7	26	47	97	120	141	166	1231	1872	1803	1862	1913	1953	2001	2061	
8	27	48	96	121	142	167	1232	1873	1811	1871	1914	1954	2002	2062	
9	28	49	99	122	143	168	1233	1881	1812	1872	1915	1961	2003	2063	
10	29	51	100	125	144	169	1241	1891	1813	1873	1916	1962	2011	2064	
11	30	52	102	126	145	170	1242	1892	1814	1881	1921	1963	2012	2071	
12	31	53	103	128	146	171	1243	1761	1821	1882	1922	1964	2021	2072	
13	32	54	104	129	147	211	1481	1762	1822	1883	1923	1971	2022	2073	
14	33	55	105	130	149	212	1482	1771	1831	1884	1924	1972	2023	2081	
15	34	57	106	131	150	1101	1483	1772	1832	1891	1931	1973	2031	2082	
16	35	59	107	132	151	1102	1521	1773	1833	1892	1932	1974	2032	2083	
17	36	60	108	133	153	1103	1522	1781	1834	1893	1933	1975	2033	2084	
18	37	61	109	134	155	1161	1523	1782	1835	1901	1934	1981	2034	2085	

EDITORIAL ITEMS

A1	A19	A37	A55	B6	B24	B42	B60	B78	C9
A2	A20	A38	A56	B7	B25	B43	B61	B79	C10
A3	A21	A39	A57	B8	B26	B44	B62	B80	C11
A4	A22	A40	A58	B9	B27	B45	B63	B81	C12
A5	A23	A41	A59	B10	B28	B46	B64	B82	C13
A6	A24	A42	A60	B11	B29	B47	B65	B83	C14
A7	A25	A43	A61	B12	B30	B48	B66	B84	C15
A8	A26	A44	A62	B13	B31	B49	B67	B85	C16
A9	A27	A45	A63	B14	B32	B50	B68	B86	D1
A10	A28	A46	A64	B15	B33	B51	B69	B87	D2
A11	A29	A47	A65	B16	B34	B52	B70	C1	D3
A12	A30	A48	A66	B17	B35	B53	B71	C2	
A13	A31	A49	A67	B18	B36	B54	B72	C3	
A14	A32	A50	B1	B19	B37	B55	B73	C4	
A15	A33	A51	B2	B20	B38	B56	B74	C5	
A16	A34	A52	B3	B21	B39	B57	B75	C6	
A17	A35	A53	B4	B22	B40	B58	B76	C7	
A18	A36	A54	B5	B23	B41	B59	B77	C8	

Which article in this issue was of most interest to you? _____

_____

THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

INFORM-A-GRAM — JUNE, 1956 ISSUE

DO NOT USE THIS CARD AFTER AUG. 31, 1956

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.)

ADVERTISEMENTS

1	19	38	62	111	135	186	1162	1824	1783	1841	1902	1941	1982	2041	2091
2	21	42	64	113	136	160	1163	1841	1791	1842	1903	1942	1983	2042	2092
3	22	43	65	114	137	162	1164	1842	1792	1851	1904	1943	1984	2043	2093
4	23	44	91	115	138	163	1181	1843	1793	1852	1905	1944	1991	2051	2094
5	24	45	94	117	139	164	1192	1844	1801	1853	1911	1951	1992	2052	
6	25	46	95	118	140	165	1193	1871	1802	1861	1912	1952	1993	2053	
7	26	47	97	120	141	166	1231	1872	1803	1862	1913	1953	2001	2061	
8	27	48	96	121	142	167	1232	1873	1811	1871	1914	1954	2002	2062	
9	28	49	99	122	143	168	1233	1881	1812	1872	1915	1961	2003	2063	
10	29	51	100	125	144	169	1241	1891	1813	1873	1916	1962	2011	2064	
11	30	52	102	126	145	170	1242	1892	1814	1881	1921	1963	2012	2071	
12	31	53	103	128	146	171	1243	1761	1821	1882	1922	1964	2021	2072	
13	32	54	104	129	147	211	1481	1762	1822	1883	1923	1971	2022	2073	
14	33	55	105	130	149	212	1482	1771	1831	1884	1924	1972	2023	2081	
15	34	57	106	131	150	1101	1483	1772	1832	1891	1931	1973	2031	2082	
16	35	59	107	132	151	1102	1521	1773	1833	1892	1932	1974	2032	2083	
17	36	60	108	133	153	1103	1522	1781	1834	1893	1933	1975	2033	2084	
18	37	61	109	134	155	1161	1523	1782	1835	1901	1934	1981	2034	2085	

EDITORIAL ITEMS

A1	A19	A37	A55	B6	B24	B42	B60	B78	C9
A2	A20	A38	A56	B7	B25	B43	B61	B79	C10
A3	A21	A39	A57	B8	B26	B44	B62	B80	C11
A4	A22	A40	A58	B9	B27	B45	B63	B81	C12
A5	A23	A41	A59	B10	B28	B46	B64	B82	C13
A6	A24	A42	A60	B11	B29	B47	B65	B83	C14
A7	A25	A43	A61	B12	B30	B48	B66	B84	C15
A8	A26	A44	A62	B13	B31	B49	B67	B85	C16
A9	A27	A45	A63	B14	B32	B50	B68	B86	D1
A10	A28	A46	A64	B15	B33	B51	B69	B87	D2
A11	A29	A47	A65	B16	B34	B52	B70	C1	D3
A12	A30	A48	A66	B17	B35	B53	B71	C2	
A13	A31	A49	A67	B18	B36	B54	B72	C3	
A14	A32	A50	B1	B19	B37	B55	B73	C4	
A15	A33	A51	B2	B20	B38	B56	B74	C5	
A16	A34	A52	B3	B21	B39	B57	B75	C6	
A17	A35	A53	B4	B22	B40	B58	B76	C7	
A18	A36	A54	B5	B23	B41	B59	B77	C8	

Which article in this issue was of most interest to you? _____

_____

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

BUSINESS REPLY CARD

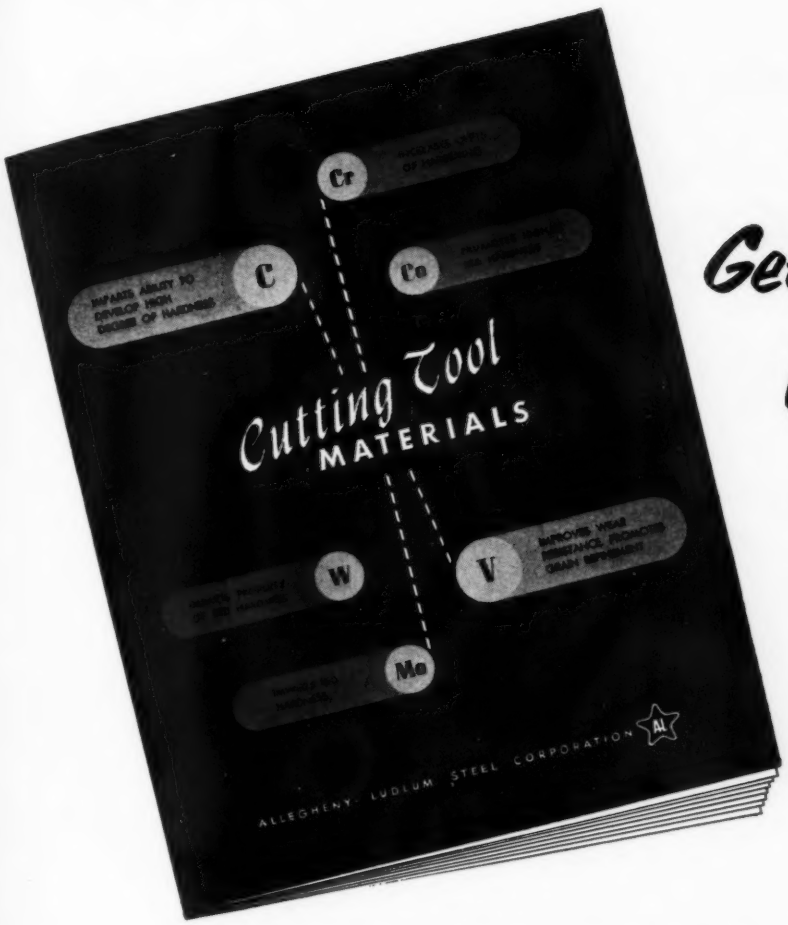
No Postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO



Get your copy...

WRITE FOR IT TODAY!

LOOK in this BOOKLET

when you're *puzzled about Tool Materials!*

A-L OFFERS YOU
Complete Service for Modern Tooling

By "complete" is meant that Allegheny Ludlum produces the full range of modern cutting tool materials, hence is in position to know and recommend the type best suited for any stated purpose. Unbiased content makes the 8½" x 11" booklet, shown, all the more valuable. Specify its title, "Cutting Tool Materials."

ADDRESS DEPT. TP-78

You should have a personal copy of this 36-page booklet close at hand, if you are continually running into new cutting problems. Use it as a guide to quick answers to scores of possible questions such as:

"Should we use *Carbide* on this job? What grade?" . . . or, "How about tooling up with *Cast Alloy* for that other run?" . . . or, "Can we cut this extra-tough stock fast enough with our usual grade of *High Speed Steel?*"

This booklet in no way replaces, but does supplement, what you can learn by practical experience or what you can gain by calling in an A-L tool engineer. In compact form and quite impartially, the booklet presents the basic facts that enable you to speedily compare the suitability of various tool materials for specific uses. *Send today for your free copy.* There is no obligation involved.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

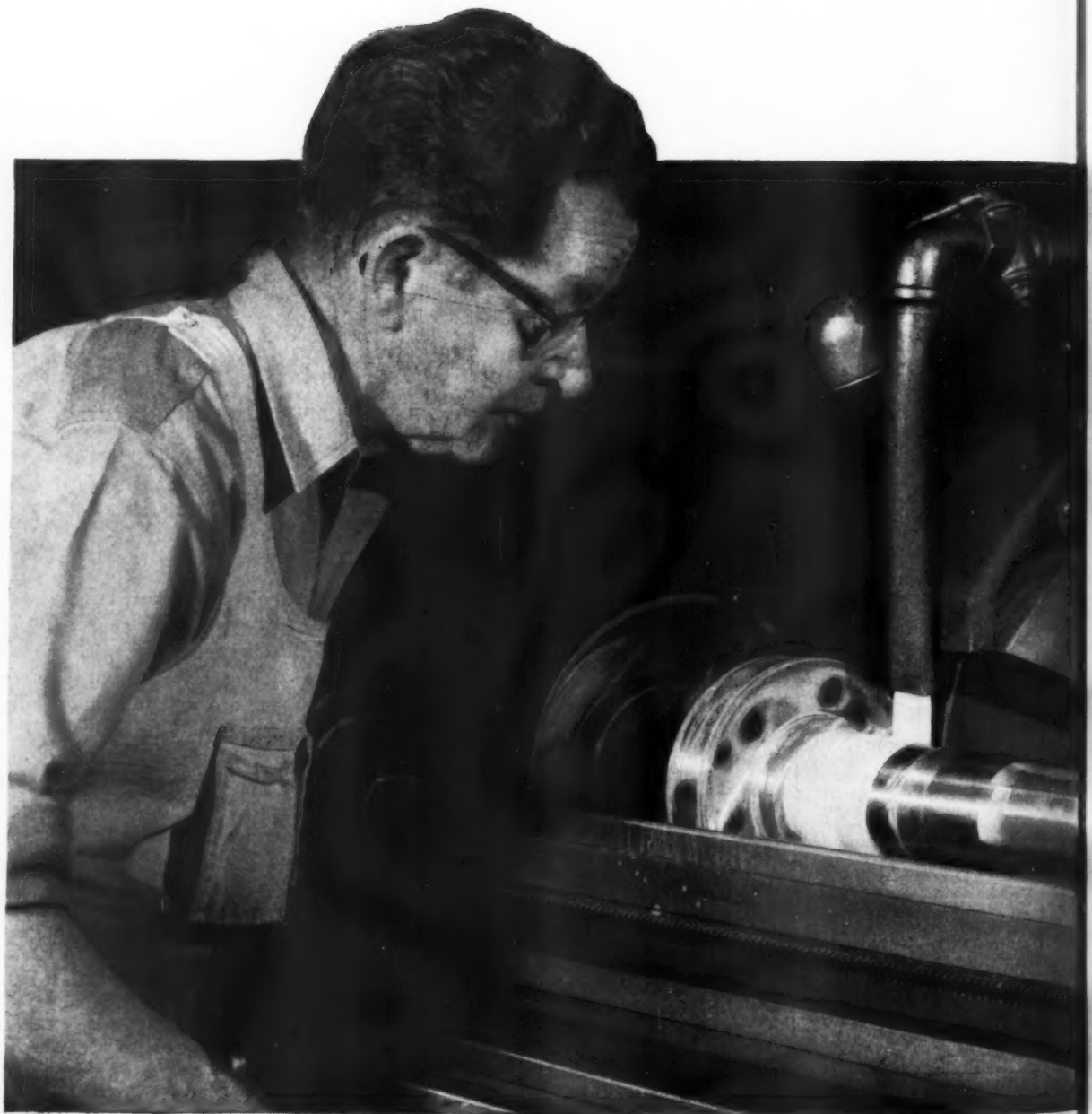
Allegheny Ludlum

W&D 3703

AL
FINE TOOL STEELS
SINCE 1854

CIRCLE INFORM-A-GRAM KEY NO. 111

Something more



than craftsmanship

produces that built-in accuracy of a Hendey Tool and Gage-Makers' Lathe

The best is not good enough for Hendey craftsmen who produce machines like our 9 in. Tool and Gage-Makers' Lathe — machines that give you toolroom tolerances easily, with no "tricks" or time-consuming adjustments.

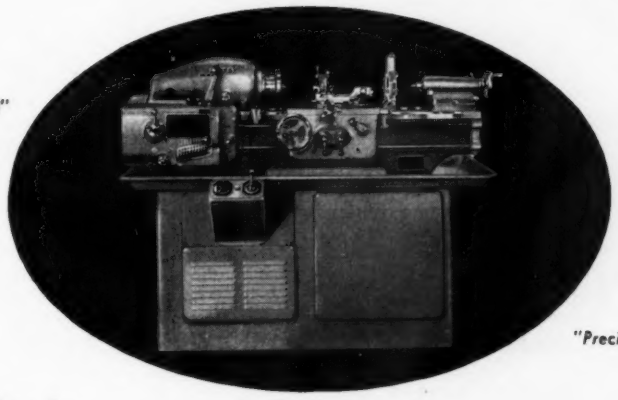
One of our men is grinding a spindle in the picture on the opposite page. It's the *care* he uses in determining wheel speed, feed, speed of work rotation, coolant flow, and wheel selection that makes the difference between a good spindle and a superior one. Experience tells him the proper relationship of these factors to the type of steel used in the spindle and the degree of hardness to which it has been processed.

Constant operating accuracy and maximum rigidity are assured because the spindle is mounted by other "craftsmen who care" in super-precision, antifriction bearings at both ends.

An electronically controlled drive is available for this 9 in. Tool and Gage-Makers' Lathe to give you quiet, infinitely variable spindle speeds from 15 to 3000 rpm. On facing cuts, stepped diameters, and tapers, you can change speeds during the cut by selecting the desired rpm on the control rheostat. Belt drive gives you smooth, vibration-free power to the spindle for fine finishes in the 25 to 3000 rpm range. Speed range from 15 to 250 rpm is achieved by back gears which operate at very low velocity.

When you're looking for the best in quality and quantity of toolroom output, look at this precision-built Hendey Tool and Gage-Makers' Lathe. Call your Hendey dealer for complete information about this machine.

Hendey 9" x 24" Tool and Gage-Makers' Lathe



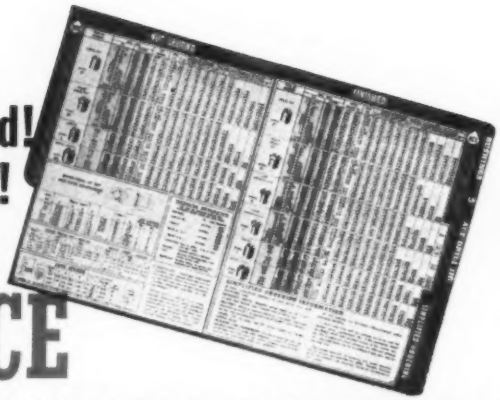
"Precision with Production"

Hendey machine division
BARBER-COLMAN COMPANY
67 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN ®

CIRCLE INFORM-A-GRAM KEY NO. 113

Simplified!
Complete!
ALL NEW!



1956 ACE DRILL BUSHING CATALOG

FREE

Contains entirely new SIMPLIFIED ORDERING section having all necessary technical data for Finished and Not-Ground bushings. Covers over 24,000 ASA and ACE Standards, Micro and Super-sizes . . . 16 pages include data on ACE-LOK Bushings for embedment, Conversion Tables, List and Quantity Prices . . . Never before a more comprehensive Drill Bushing Catalog. Write for your free copy and name of nearest dealer.

Stocking Distributors in All Important Industrial Areas

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

Please send FREE catalog No. F

NAME_____

ADDRESS_____

CITY_____ STATE_____

COMPANY NAME_____

COMPANY ADDRESS_____

CITY_____ STATE_____

NAME OF PRESENT BUSHING SUPPLIER:

_____

CIRCLE INFORM-A-GRAM KEY NO. 114

ADVANTAGES OF PLASTIC TOOLING

by Fred Lyijynen
Supervisor, Plastics Dev. Dept.
Automotive Body Division
CHRYSLER CORPORATION
Detroit, Michigan

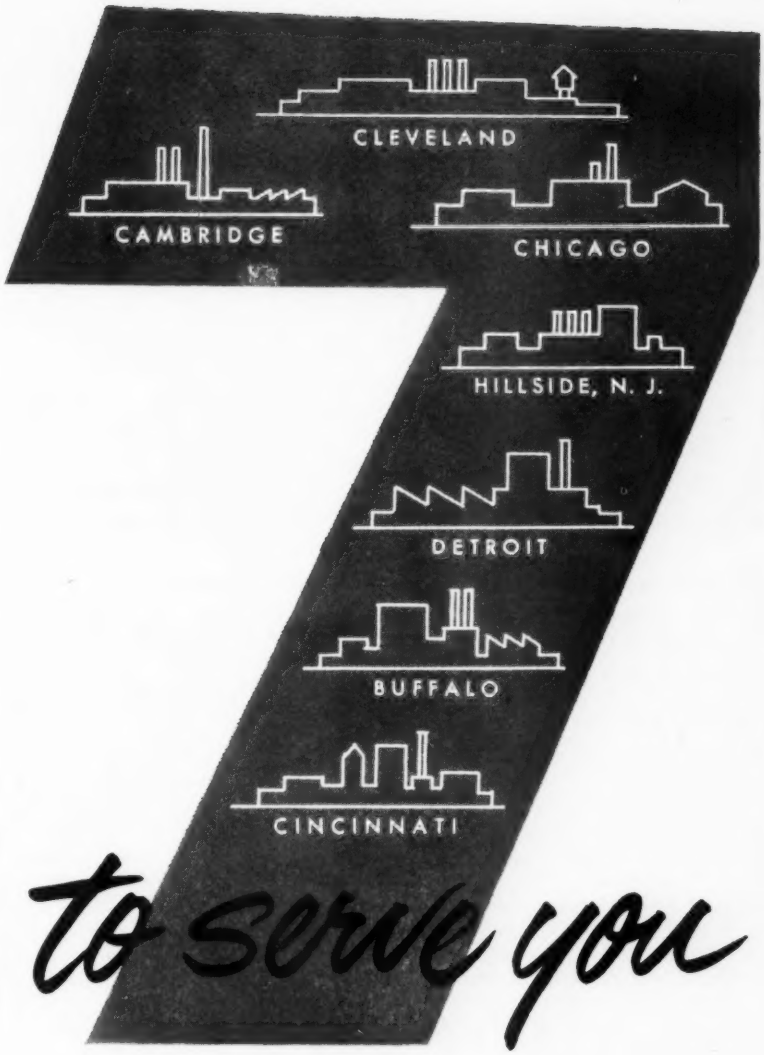
IN MY OPINION SLOWNESS in accepting new techniques causes the loss of money and customers. I fully realize that anything as radical as substituting plastics, a material with which most engineers are unfamiliar, for metal, the old stand-by, requires courage. However let me point out that plastics are out-performing metals in many instances in the tooling field.

The progressive plastics industry approaches us, from time to time, with suggestions for possible new applications in plastic tooling. You will find on investigation that, for the most part, their proposals are worthwhile. On investigation you might also find new ideas for the use of plastics, which can be developed.

Basic tooling of reinforced plastic is now preferred by the large automotive companies; tool suppliers equipped to handle this type of work are realizing an increased share of the business, on items that have been considered "standard" from year to year. Most tool shops that have been forced to enter the reinforced plastics field, just for the purpose of retaining customers, have upon the acquisition of a little experience been able to cut their cost to the extent of making money. This was due to the versatility of the plastics used, and their ability to offer time and labor-saving short-cuts in tool construction. Are you taking advantage of this versatility?

A periodic check on ordinary shop burden will show secondary tooling to comprise a bulk of the expense. Naturally then, any decrease in secondary tooling costs will permit more competitive bids to your customers. Secondary tooling, such as templates required in tool construction, can be more economically made of reinforced plastics. Identifying stations and lines, flange angles, cut-outs and hole locations as well as flat plane conversion can be more accurately and more easily made with reinforced plastic templates. Moreover, better work can be performed without expensive layout time. We have found that everyday tooling can be expedited through the use of check forms and molds economically made of plastics. Yokes, frames, supporting members, permanent or

Adapted from a paper presented at the Twenty-Fourth Annual Meeting of the American Society of Tool Engineers, at Chicago, Illinois, March 19-23, 1956.



A call to any one of our seven warehouses will get you speedy service on your order . . . whether it's for *alloy steel bars, billets or forgings,* in any size, shape or treatment you need.

All seven warehouses are located in principal industrial areas. Each is modern and well-stocked, and staffed by expert metallurgists.

Call now if you need our own HY-TEN steels – "the standard steels of tomorrow", or standard AISI or SAE grades.

Or write for *free* copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

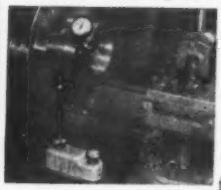
In Canada: Sanderson-Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.

135 Sidney Street, Cambridge 39, Massachusetts

CIRCLE INFORM-A-GRAM KEY NO. 115

ENCO
TINY TITAN
No. 150 No. 150
MAGNETIC BASE HOLDER
Cuts Set-Up Time 50%



Mounts to flat surfaces or rounds down to ¾" Dia.

Extra powerful 125 lb. pull!

Amazing Versatility

Send for Latest Bulletin

ENCO Manufacturing Co., Dept. 766
4520-26 W. Fullerton Ave., Chicago 39, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1161

Empire
LIVE CENTERS
ARE
• ACCURATE • VERSATILE
• HEAVY DUTY

THE TAPERED SEAT ASSURES ACCURACY OF ±.0001

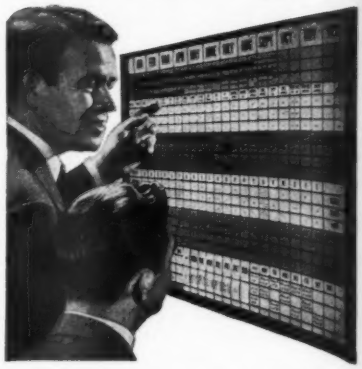
Manufactured in all tapers. 1 to 6 MT in stock. Special shanks and points made to order.
PAT. PEND.

Points illustrated are standard.

Ask your Supplier or Write for Literature
ROYAL PRODUCTS
88 UNION ST. MINEOLA, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1162

You See What's Happening



BOARDMASTER VISUAL CONTROL

Graphic Picture of your operations—spotlighted in color. You see what is happening. Saves you time, prevents errors. Simple and Flexible. Easy to operate. Write on cards and snap in grooves. Ideal for Production, Sales, Scheduling, Etc. Made of metal.

Full Price $49.50 with cards

FREE 24-Page BOOKLET NO. Z-400 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS
55 West 42nd St. • New York 36, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1163

ANNOUNCING - another T&P READER SERVICE

KNOW-HOW REPRINTS NOW AVAILABLE

Use this ad as your order blank and mail to:
HUEBNER PUBLICATIONS, INC.
1975 Lee Road
Cleveland 18, Ohio

		No. of Copies		Amount
No. 8.	Selling Management a Quality Control Program.	_____	@ 35c ea.	_____
No. 9.	Do You Have a Unified Q. C. Program?	_____	@ 20c	_____
No. 10.	Larger Diameters . . . Closer Tolerances?	_____	@ 20c	_____
No. 11.	How Do We Measure Machine Capability?	_____	@ 15c	_____
No. 12.	Quality Control of Cemented Carbides.	_____	@ 15c	_____
No. 13.	Which Standard Deviation? — Measuring the Variability of a Product.	_____	@ 15c	_____
No. 14.	Plant Application of Acceptance Sampling by Attributes.	_____	@ 15c	_____
No. 15.	Statistical Methods for Solving Top Management Problems.	_____	@ 15c	_____
No. 16.	Quality Control of Job Lot Production.	_____	@ 15c	_____
No. 17.	Sell Yourself to Tomorrow's Engineers . . . and to the Community. — an article of special interest to all.	_____	@ 20c	_____
No. 18.	How to Design Your Matched Metal Molds.	_____	@ 15c	_____
No. 19.	Magnetic Dies Cut Tooling Costs.	_____	@ 20c	_____
No. 20.	Precision Gaging of Conical Holes.	_____	@ 20c	_____
No. 21.	Safety Considerations for Press Controls.	_____	@ 20c	_____
No. 22.	Helical Carbide Cutters Improve Spar Milling.	_____	@ 20c	_____
No. 23.	Adapters Facilitate Automatic Welding of Inside Seams.	_____	@ 15c	_____
			Total $	_____

Check, money order or cash with order, please. Open account shipments on company purchase orders when total amount exceeds $3.00. No. C.O.D.s please. Ohio customers add 3% sales tax. Quantity Prices quoted on request.

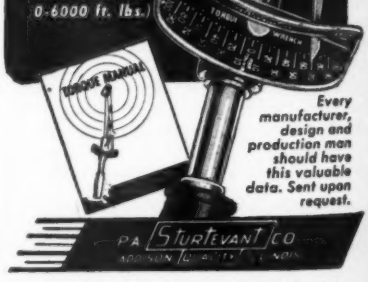
NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

Over 85% of the torque wrenches used in industry are

STURTEVANT
TORQUE WRENCHES
Read by Sight, Sound or Feel.

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch grams...inch ounces...inch pounds ...foot pounds (All sizes from 0-6000 ft. lbs.)



Every manufacturer, design and production man should have this valuable data. Sent upon request.

PA STURTEVANT CO
MADISON ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1164

temporary, can be made without the usual distortion that is so familiar to welding. Are you using plastics in your secondary tooling programs?

Statistical proof showing the acceptance, and the use, of plastics as a permanent medium of construction, has more than doubled itself in the past two years.

The interest in plastics has advanced due to competition. Competition has forced users to find ways, to increase their speed of fabrication. Speed in fabrication makes new applications available — and so it goes. On the other hand, the advance has been retarded by the shortage of personnel familiar with handling plastics. Unfortunately, many extravagant claims have been made about plastic, by unqualified persons with little knowledge of resins, materials or methods. On the other hand, effective effort has been made by responsible groups and societies to provide authoritative information. Along with the aid of the societies is the help offered by several responsible formulators. Are you taking advantage of these authorities for the purchase of the proper materials and the use of these materials?

Several organizations, such as the ASTE and SPI, have formed committees on all phases of the plastics industry. These committees cover the field from the resin supplier, through the fabricator, and even the users of the fabricated part. The purpose being to provide assistance where needed and to circumvent bottlenecks or shortages, should they arise. Immediate benefit can be realized by the smaller manufacturer, if he would call in one of these sources of information. Before purchasing expensive new equipment, either the resin formulator or one of the organizations promoting plastics can give him immeasurable aid. His present equipment can be evaluated as to its use in the program. His manpower can be appraised. Steps to take as to purchasing new equipment can be established. Have you given this due consideration?

Draw dies, form and flange dies, drop hammer dies, hydroform blocks, assembly fixtures, drill fixtures, checking fixtures, contour template panels, die models, prototype models, mock-ups, assembly models and various die facings are but a few of the applications of plastics uses in the automotive, aircraft and allied industries. Prototypes in plastic are especially assistant to the engineer in helping him to determine the design and the assembly of component parts. Have you and your engineers used this quick and easy method of tooling?

In order to save time and money, plastic dies are being used to ascertain the effect of certain drawing

. . . *Continued on Page 125*

Famco Air Presses at Bell & Howell Company, manufacturers of precision, photographic, optical and electronic equipment

3 famco air presses

save Bell & Howell Company $2,000 per year

Famco Air Presses have replaced the engraving of serial numbers on three of Bell & Howell's major camera lines. Collectively this change-over has saved approximately $2,000 per year based on present production facilities and the Air Presses paid for themselves in approximately 6 months time. In addition to savings, Famco Air Presses performed with minimum maintenace and a perfect safety record.

Bell & Howell has been using Famco Machines for approximately 5 years and has about 150 machines—air presses, arbor presses, power presses. They are used for various types of bench assembly work—pressing pins into castings, pressing shafts into gears, staking and stamping serial numbers.

New Double-Acting Air Press

Newest addition to Famco's Air Press line is the double-acting air press which provides increased vertical height, throat depth and ram stroke. Air cylinders support unlimited upper die weights and permit faster operating cycles. The ram is supported and guided independently of the cylinder piston rod and is keyed to prevent turning. A hole through the platen is provided for operations needing punch slug or workpiece clearance. Standard equipment on this new double-acting air press includes lubricator, filter, regulator, regulating gage and two mufflers.

Our complete Air Press line has now been incorporated in the new Air Press Catalog. Use the coupon below for your FREE copy of this new catalog.

famco machine company

3124 SHERIDAN ROAD • KENOSHA 66, WISCONSIN

Air Presses • Arbor Presses • Band Saws • Drill Presses • Foot Presses
Power Presses • Squaring Shears

Please send me at no charge or obligation your new Air Press Catalog which includes the entire Famco Air Press line.

Name_____

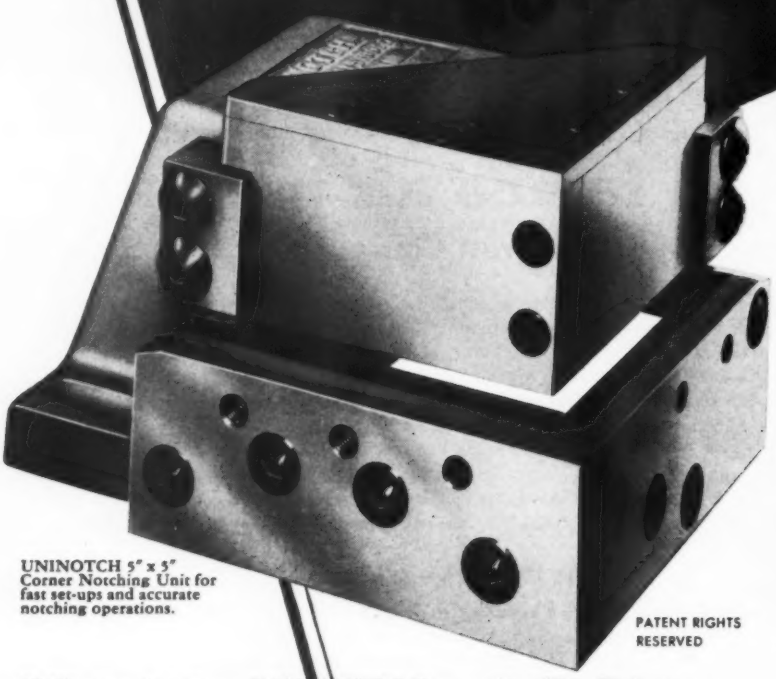
Firm Name_____

Address_____

City_____ Zone____ State_____

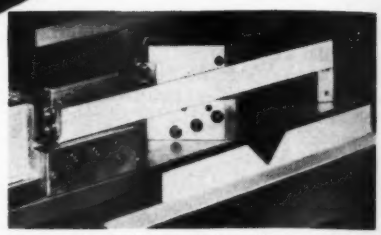
CIRCLE INFORM-A-GRAM KEY NO. 117

Announcing UNIPUNCH



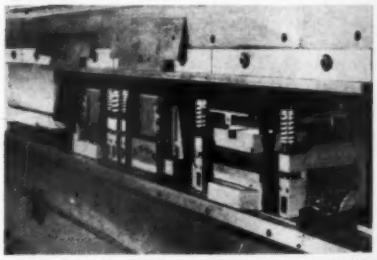
UNINOTCH 5" x 5" Corner Notching Unit for fast set-ups and accurate notching operations.

PATENT RIGHTS RESERVED



Set-up of 2 UNINOTCH Corner Notching Units. Note work piece in foreground with end of angle leg notched and V notch in center showing versatility of UNINOTCH Corner Notching Units.

Showing set-up of combination hole-punching and notching with finished work piece in foreground.



PUNCHING, MARKING, NOTCHING AND FORMING

Showing three operation set-up which is template mounted on a #5100 Unipunch Bed Rail. First operation beginning at right punches 2 holes and numbers part. Second operation punches 3 holes and notches 2 corners. Third operation forms part. Note samples on ram.

NEW complete line of UNINOTCH Corner Notching Units are designed and built for quick, easy interchanging of all punch and die steels. This *exclusive* advantage permits removing and replacing the punch and die steels at your plant without returning the units to factory for service. Both steels are held in absolute alignment by holder. In addition, a complete line of UNINOTCH Vee and Edge Notching Units are available from stock.

Compact design with gib construction permits close notching to inside leg of angles and location of holes close to corner notch in combination hole-punching and notching set-ups.

Series A UNINOTCH Units have the popular 8-3/8" shut height and 3-1/2" die height for material up to 1/4" thick. Series B UNINOTCH Units have the popular shut height of 5-1/2" and 2-19/32" die height for material up to 1/8" thick permitting combination notching and piercing operations with Unipunch Hole-Punching Units in the same press or press brake set-ups on rails, templates or T-slotted plates.

WRITE FOR CATALOG showing the complete line of UNINOTCH Notching Units.

PUNCH PRODUCTS Corporation

3804 Highland Avenue, Niagara Falls, N. Y.

Manufacturers of UNITIZED Hole-Punching and Notching Equipment

CUSTOMER SERVICE

By maintaining a complete stock of units, punch and die steels and parts backed by an experienced CUSTOMER SERVICE DEPARTMENT, customers are assured of QUICK DELIVERY. Off-standard units and requests for quotations receive immediate attention. Complete engineering service, too, on Unitized Tooling.

CIRCLE INFORM-A-GRAM KEY NO. 118

GEORGE L. DETTERBECK CO.

SINCE 1911

World's Largest Exclusive Manufacturer of
SCREW MACHINE TOOLS!

CUTTING CAMS • HIGH SPEED STEEL AND CARBIDE FORM TOOLS • SPECIAL CUTTING TOOLS • SPLIT DRILL BUSHINGS • CROSS SLIDE KNURL HOLDERS • TOOL BITS • BOX TOOLS • BURNISHING TOOLS • REVOLVING STOPS • RECESS SWING TOOLS • FORMING SWING TOOLS

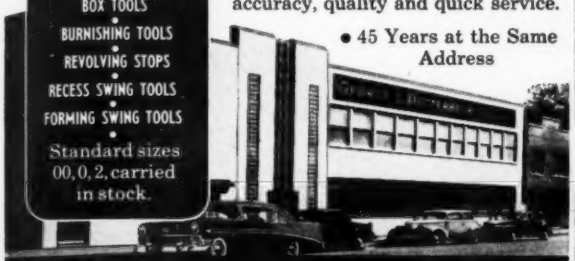
Standard sizes 00, 0, 2, carried in stock.

We specialize in one thing only... designing and making SCREW MACHINE TOOLS!

45 years experience goes into every tool we make. They come to you ready for use... Precision design... Skilled workmanship... Finest materials.

Our extensive facilities save you TIME... MONEY... and give you accuracy, quality and quick service.

• 45 Years at the Same Address



GEORGE L. DETTERBECK CO.
1871 Clybourn Avenue • Chicago, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1191

The New Improved *Fluid Feed* ROTARY TABLE

Deftly holds and delivers small parts to drill, tap, swage, stake, etc. 8, 12 or 24 stations accurate to .003". Positive, uniform air-hydraulic indexing—not a mere hydraulic check. Indexes slow or fast, up to 2800 per hour. Compact and sturdy, easy to tool and hook up. Standard dial plate 12" x ½" ground steel. For a new job, simply tool up a new dial. Readily combines with "MEADMATIC" Timer, Air Hammer, Air Press, Drill Presses, etc.—to make almost completely automatic machines—operator merely loads.

Send for new Air Power catalog today!

(See Volume III Thomas' Register for nearest distributor's address, phone number.)

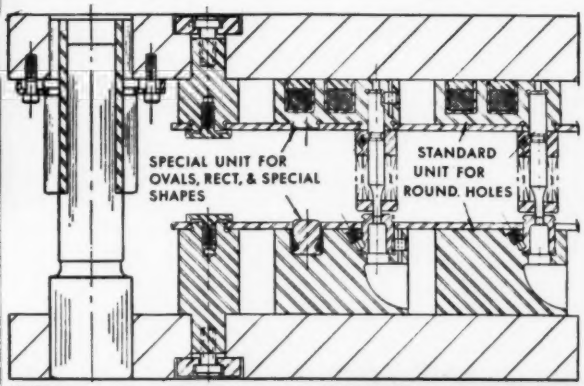
MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., Dept. HA-66, Chicago 41, Ill.

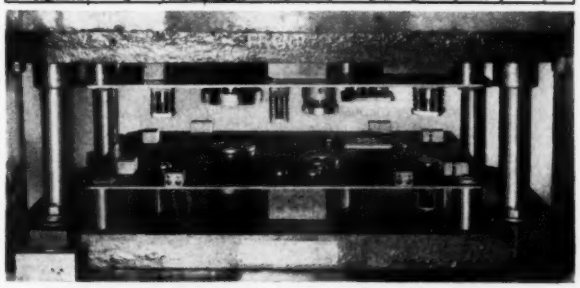
PATHFINDER IN AIR POWER AUTOMATION

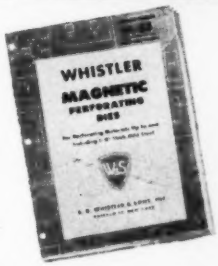
CIRCLE INFORM-A-GRAM KEY NO. 1192

MAGNETIC DIES *by WHISTLER*

• Operate like a single-purpose die • All punch and die parts interchangeable • Pierce metals up to ¼" thick steel • Changes made from one operation to another while the die set is in the press • Change-over time from 5 to 20 minutes, depending upon size of die set • Lower die costs • Saves die storage space • Precision work in any size press • Backed by Whistler's 40 years of die making experience serving the nation's leading plants.







YOU NEED THIS CATALOG... Shows by photos, drawings and prices how the Magnetic Die* system drastically cuts die costs, saves valuable time, speeds production. *Write for it today.*

**Whistler Magnetic Dies are fully patented and are sold under the copyrighted trade name Magna-Die.*

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 1193

Manufacturers of UNITIZED Hole-Punching and Notching Equipment

CIRCLE INFORM-A-GRAM KEY NO. 118

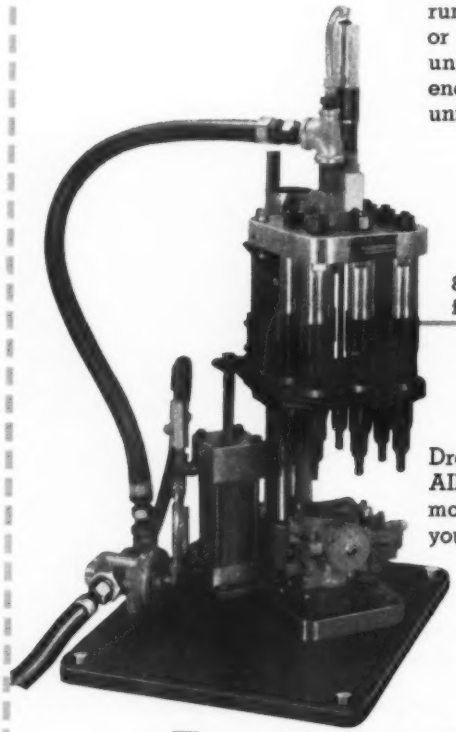
AIRengineering at work
REPORT No. 5098B-3

Multiple Screw Driver assembles 400 carburetors per hour

Assembling carburetors was a slow, one-screw-at-a-time operation until AIR engineering solved the bottleneck. Now one operator uses this 8-spindle automatic Multiple Screw Driver to help turn out more than 6 completed carburetors per minute—400 every hour.

This compact, easy-to-operate Multiple Screw Driver is just one more example of how AIR engineering is helping modern industry solve problems and cut production time and costs.

All the experience of Ingersoll-Rand in speeding up fastening through AIR engineering multiple units is yours for the asking. Whether your operations involve screw-driving or nut running with either hand-held or automatic production line units, Ingersoll-Rand can engineer and build just the unit best suited to your needs.



8-Spindle Multiple Screw Driver for carburetor assembly.

Drop us a line if you'd like an AIR engineer to analyze and make recommendations on your fastening operations.

Ingersoll-Rand

8-341

11 Broadway, New York 4, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 120

ERRATUM

Dr. Hans Schmidt, Manheim-Kaferal, Germany calls our attention to a misstatement in the March 1956 issue of TOOLING & PRODUCTION, page 95, last paragraph, wherein it was indicated that Dr. Albert A. Michelson was the inventor of the Zeiss Koester Absolute Interferometer.

Actually, Professor Dr. W. Koesters invented the Zeiss Koester Absolute Interferometer. It was built before World War II by Carl Zeiss over Dr. Koester's design for measuring gage blocks by comparing with light waves, which uses light sources of either helium, krypton, cadmium or the mercury 198 isotope.

Dr. Albert A. Michelson invented the interferometer principle while working primarily on a device for detecting velocity changes in light waves due to the motion of the medium through which they pass. In 1892 he discovered that the device was capable of precise measurement to a millionth of an inch.

TOOL AND DIE SHIPMENTS WILL CONTINUE HIGH

A continued heavy volume of orders for special tooling in most production centers is the forecast of trustees of the National Tool and Die Manufacturers Association.

"There is a strong indication that the contract tool and die industry will better the volume of shipments made in its all-time record year, 1953," said Joseph N. Huser, president of the association, at their spring meeting in Washington. "In 1953 our industry shipped approximately three-quarters of a billion dollars worth of special tooling—dies, jigs, fixtures, gages, plastic molds and special-purpose machines. This year the total is likely to go to $800-million.

Despite this outwardly optimistic picture, the tool and die manufacturers, along with other small businessmen, have not been making a satisfactory profit, according to government officials who addressed the meeting.

Walter B. Stults, Staff Director, Senate Small Business Committee, reported that in 1954 companies with sales under $250-thousand made a 0.7% profit per dollar of sales after taxes while companies with sales of $100-million and more averaged a 6.5% profit. The picture for the smaller companies improved somewhat in the first three quarters of

PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 1192

CIRCLE INFORM-A-GRAM KEY NO. 1193

1955, however. For that period, companies with sales under the quarter-million-dollar mark averaged 1.2% profit, while the hundred-million-dollar group increased their average earnings to 7.2%.

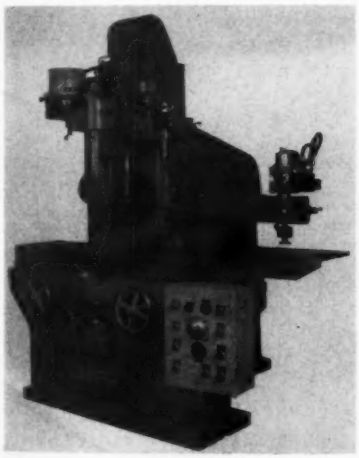
Referring to this unfavorable profit comparison, Senator Andrew F. Schoeppel, a member of the Senate Small Business Committee, said that he is confident that Congress, "in the relatively near future," will pass measures offering some tax relief to small business.

Automatic Die Sinker Operates Three Ways

A fully automatic bed type die sinker, constructed of solid cast iron, well ribbed and reinforced to handle the heaviest cuts and maintain perfect accuracy, has been designed for three way operation and is equipped with a Turchan magnetic tracer.

It is primarily a fully automatic die sinker. It can also be used as a power operated straight milling machine or as a hand operated straight milling machine. For contouring, a second tracer control is used.

These three methods of operation are selected on the central knob of the control panel. Automatic reciprocating feeds and index are interchangeable with ram and table and can be changed to hand control by simply turning the central knob on the control panel.



As the Turchan tracer automatically coordinates the vertical movement of the cutter with table and ram movements to accurately reproduce the profile of the master model, electric limit switches control adjustment of length of stroke on table and ram.

Descriptive literature is available from Turchan Follower Machine Co., 8259 Livernois Ave., Detroit 4, or **Circle Inform-A-Gram No. D2.**

Have you seen what this CAN DO FOR YOU?

Torque control IMPACTOOL

NEW accuracy and speed for precision nut running jobs . . .

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

* 2 TORSION BARS PROVIDE MULTIPLE TORQUE SETTINGS

- No. L735 Max. torque 60 ft. lbs.
- No. H735 Max. torque 90 ft. lbs.

For torques up to 550 ft. lbs. a Size 5340T Torque Control Impactool is available.

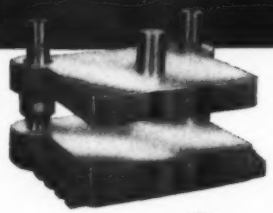
Get a free demonstration of Ingersoll-Rand Torque Control Impactools by an I-R AIR engineer now... or write for additional information.

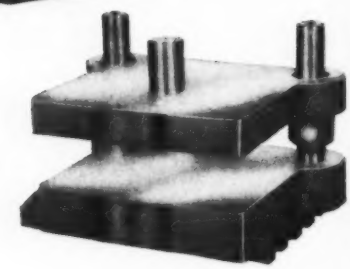
Ingersoll-Rand
11 Broadway, New York 4, N.Y.
IMPACTOOL DIVISION
8-342

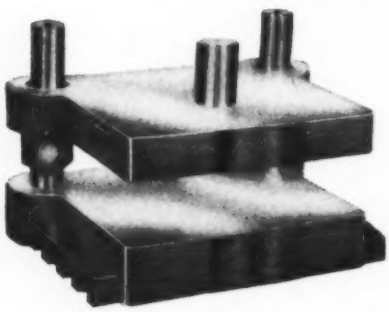
CIRCLE INFORM-A-GRAM KEY NO. 121

A Limitless Range of Die Set Sizes Jig-Bored to *YOUR* Specifications

SUPERIOR HAS THEM ALL







No Premium Price

No limitations to so-called "standard sizes" — result no waste — when you use Superior Die Sets. Superior sets are all *individually jig-bored to your specifications.* Result — the number of sizes you can get is almost limitless — you save on excess steel, needless machining, unnecessary weight and handling. Best of all, Superior Die Sets are priced competitively in all given sizes, so you save money in original cost by ordering only the exact size you need.

Check the many other exclusive features of Superior Die Sets and you'll see why they lead the field. Write for catalog and full information.

for fast local service call these Expert Superior representatives

- Kalamazoo, Mich., Phone 5-7988
- Indianapolis, Ind. BRoadway 5668
- Chicago, Ill., RAndolph 6-8871
- Dallas, Tex., Riverside 5138
- Rockford, Ill., Phone 3-3932
- St. Louis, Mo., JEfferson 5-1223
- Milwaukee, Mitchell 5-6027
- Orange, N. J., ORange 5-5810
- Dayton, Ohio, Hemlock 6209
- Memphis, Tenn., Phone 33-7727
- Cleveland, Ohio, KEnmore 1-2015
- Eau Claire, Wis., Phone 2-3453
- Minneapolis, Minn., FR 1-1321
- Winter Park, Fla., Phone 5-0464
- New Haven, Conn., LO 2-1731
- Brooklyn, N. Y., NAvarre 8-6690

PLANTS AT

- Milwaukee, Wisc. Mitchell 5-6027
- Plainville, Conn. SHerwood 7-2701

SUPERIOR **Steel Products Corp.**

2754 So. 19th Street, Milwaukee, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 122

ONE
Clark LATHE TOOL HOLDER
Grips 3 bit shapes

Square Bits

Round Bits

Cut-off Bits

Threading Bits

Many Bit Sizes!

Clark LATHE TOOL HOLDERS do the *USUAL* and *UNUSUAL* JOBS BETTER IN EVERY SHOP—*SOLIDLY GRIP* ROUND, SQUARE and RECTANGULAR SHAPES—Enable turning, threading, boring with bars as well as cut-off operations with *ONE* tool holder!

Special vee clamp operating on diagonal accommodates several bit sizes, grips *full length of the cutter channel.* Holds bits tighter, eliminates chatter and harmonic vibration. Excellent rigidity for carbide tools!

4 Clark Lathe TOOL HOLDER SIZES cover complete range of lathe requirements from ⅛" bits to ⅝" bits. Write for prices or order from your dealer.

Robert H. Clark Company
9330 Santa Monica Blvd., Beverly Hills, California

CIRCLE INFORM-A-GRAM KEY NO. 1231

EACH Severance CARBIDE HAND FILE SAVES US $30.00 A WEEK!*
* on basis of actual reports
MANY SPECIAL APPLICATIONS IN USE
HARD ABRASIVE MATERIALS POSE NO PROBLEM
CAN BE RESHARPENED MANY TIMES
AN $8.00 RESHARPENING WILL OUTLAST APPROXIMATELY 150 ORDINARY STEEL HAND FILES
START SAVING YOUR DOLLARS QUICK!
We'll send you information and prices via RETURN MAIL!
Phone, wire or write us NOW! ☆ PHONE SAGINAW 3-8421
Severance TOOL INDUSTRIES INC.
730 Iowa Ave. Saginaw, Michigan
MIDGET MILLS
REGRINDING
INSIDE DEBURRING CUTTERS
OUTSIDE DEBURRING CUTTERS
HAND DEBURRING CUTTERS
TUBE END DEBURRING CUTTERS
CHATTER-FREE ECONO-SINKS
SPECIAL CUTTERS
MICRO-MILLS & BORE-MILLS
BALL SEAT REAMERS

CIRCLE INFORM-A-GRAM KEY NO. 1232

HONITE METHOD... for better barrel finishing

"Hand-buffed" results at 1/10 the cost!

This die-cast aluminum handle for furniture is one of several thousand processed each month by a Cincinnati, Ohio manufacturer. The handles must be given a super-smooth finish prior to plating—a job formerly done by rough finishing with a competitive barrel finishing abrasive, then *hand* buffing to produce the desired finish. The hand buffing cost was prohibitively high.

Recently, this company switched to the HONITE Barrel Finishing Method, using a 2-step process—cutting with Regular HONITE Chips and HONITE Micro-Cut Compound, then polishing with HONITE Multi-Burnish Compound.

This method produces the same quality finish as hand-buffing, at 90% lower cost!

You, too, can cut costs with the HONITE Barrel Finishing Method. Call your nearby HONITE Sales Engineer today. Or write for free booklet: "Facts and Figures Report on Honite Barrel Finishing". Address: Minnesota Mining and Manufacturing Co., Dept. MH-66, St. Paul 6, Minn.

Honite BRAND
PRODUCT OF 3M RESEARCH

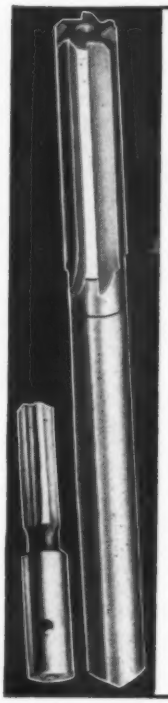
Made in U.S.A. by Minnesota Mining and Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City. Makers of "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

3M

CIRCLE INFORM-A-GRAM KEY NO. 1233

THOUSANDS
of
SUPEREAM
STUB and
CHUCKING
REAMERS
by the
THOUSANDTHS

in our stock bins, ready for immediate shipment



All flutes ground after heat treatment to eliminate freezing of chips.

*All Decimal Reamer diameters are held to plus .0002 and minus .000 for close sizing. Chucking reamers available in 4 sets.

The PRECISE SIZE FOR THE JOB!

No need to order specials and wait? NOW — right from stock ready for immediate delivery . . . Decimal Chucking or Stub Reamers. Fast-cutting, long-lasting 18-4-1 high speed steel. Made for your production economy . . . and SMOOTH REAMING.

We take pride in the fact that we perpetually maintain — IN STOCK — the largest decimal range of reamers available from any single source in the world!

Our engineering service is always at your disposal.

FREE!

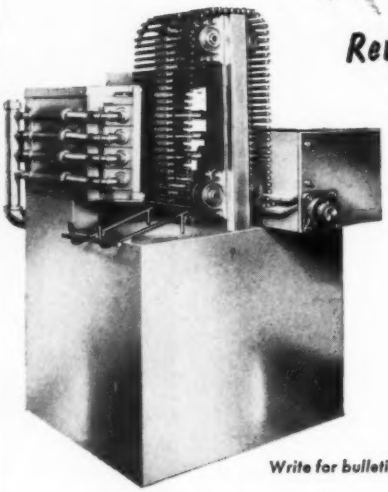
Just off the press! Complete Reamer Catalog with the World's Greatest Reamer selection by the thousand's. Write for it.

In Emergency . . .
Phone Libertyville 2-4200

TWENTIETH CENTURY MANUFACTURING CO.
ROUTE 176 and BRADLEY ROAD
BOX 429TP LIBERTYVILLE, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1241

The Automatic G.A.S. "Hot Rod" End Heating Unit



Write for bulletin

Revolutionizes—

- Bolt Heading • Upsetting
- Swaging • Localized Hardening

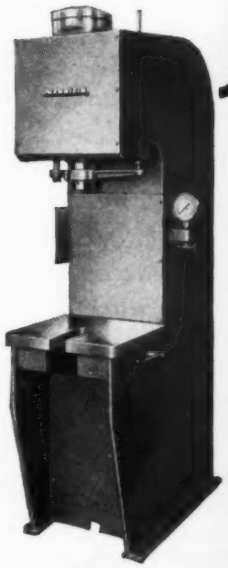
For example: The Model 8-4 (Illustrated) heats the ends of ½" rod to 1900°F at the rate of 900 pieces per hour—a heating time of only 50 seconds per rod. Automatic hopper feed and conveyor supply "hot" pieces at a steady rate, all alike, up to temperature at one end, and perfectly cold at the other (handling end). Heats sections up to 4" in length. Standard models available for bar stock ¼" to 1½" in diameter, and 6" to 24" in length.

GAS APPLIANCE SERVICE, INC.
Industrial Gas Engineers
1201 WEBSTER AVENUE • CHICAGO 14, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1242

PRICE LIST

ON HANNIFIN STOCK
HYDRAULIC PRESSES



1-TON	$ 552
2-TON	$ 627
5-TON	$1,306
8-TON	$1,356
10-TON	$1,855
25-TON	$3,401

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN

HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1243

CIRCLE INFORM-A-GRAM KEY NO. 1232

Sheeting, "Safety-Walk" Non-slip Surfacing.

CIRCLE INFORM-A-GRAM KEY NO. 1233

. . . Tooling, from Page 117

operations on a particular metal or design. Steel dies are expensive — it is easier to experiment in plastic first. Where plastics can be used as the final tooling material, they have been found to be accurate and durable, even with the rough handling encountered in high production runs.

In many cases production has been increased time and again due to the compact construction and light weight possible. Another factor in increased production is the use of duplicate tooling which is more feasible with plastic tools, from the cost standpoint.

It is important that you investigate plastics now as to their inclusion in your operations. Since one formulation will not serve all tooling applications, it becomes necessary that your personnel acquire skill in the use of plastics at the earliest possible date. As your craftsmen become more proficient in their applications, the more noticeable will be your economies.

Manufacturers, such as Chrysler Corporation, have proven the value of plastic tooling; Chryslers continued investigation and development will undoubtedly uncover new applications to further expand the field.

As a proponent of this rapidly developing tooling technique, I urge you to prepare yourselves and your companies to use plastics to maintain your competitive positions in industry.

* * *

The following thoughts were condensed from the discussion period after the above paper was delivered:

- Of late, about 25% of Chrysler's tooling has been plastic. Their current tooling program, which is underway, will have more than 30% of its tools employing plastics.
- Plastic dies have various advantages over Kirksite dies; they can be built faster, they are cheaper to build, repairs are easier and the plastic facings of the dies hold well and are more stable.
- Since experts in the plastics field are few, the best personnel for a new plastics department would be Tool and Die Makers. These men are the best qualified to learn a new allied field. However, there are many menial tasks in "plastics" which can be handled by laymen.
- The adhesion between metal and plastics is poor, therefore plastic dies **cannot** be metal-plated for increased wear.
- For the small manufacturer, much "know-how" and help can be had from the suppliers of the raw materials which make up plastic tools. In the near future handbooks will be available, but an experienced formulator can be no end of help.
- Some people are sensitive to specific chemicals, as others are sensitive to food, pollen, etc. Common sense

NILSON 4-SLIDE TAKES A TOUGH ONE . . .

Mass production of body trim clips for a leading make automobile proved a complex forming problem. A. H. Nilson's 4-Slide (Model S-4-T) did the job, forming .025" x 3", 1065 C.R.A. steel at 54 strokes per minute! Accurate, fast, and automatic, Nilson 4-Slides keep pace with one of the nation's biggest industries.

THIS ONE WAS EASY . . .

A Nilson 4-Slide, Number 1, forms 150 drapery hooks per minute from 0.70 basic steel wire. Nilson 4-Slides form wire or ribbon stock from the coil. They straighten, feed, pierce, blank, swage, stamp or coin, cut and form in one, fast, automatic operation . . . accommodate wire up to .5" dia., in feeds to 32" max., and ribbon up to 3.5" wide. Press sections from 5 to 75 tons.

A. H. Nilson provides forming recommendations from detailed information without obligation. Send for catalog.

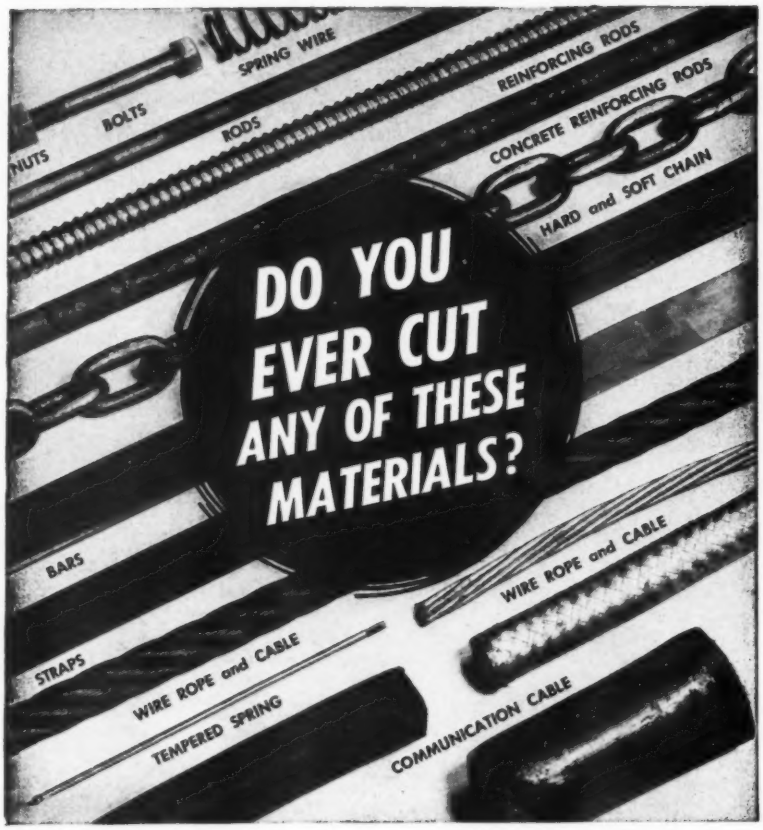
A.H. NILSON MACHINE COMPANY

1522 RAILROAD AVENUE, BRIDGEPORT 5, CONNECTICUT

Automatic Chain Making Machines : Staple Forming Machines : Wire and Stock Reels : Wire Straightening Equipment : Slide Feeds for Presses

CIRCLE INFORM-A-GRAM KEY NO. 125

CIRCLE INFORM-A-GRAM KEY NO. 1241



— with hand tools on the job or in the shop?

Porter hand power cutters cut up to and including

3/4" bolts — hard or soft
3/4" chain
5/8" rod
3/4" wire rope
as well as steel strapping, insulated cable, spring wire, etc.

SEND for this book which shows materials to be cut and cost comparisons between cutting methods. It may save you money.

H. K. PORTER, INC.
Somerville 43, Mass. Dept. T-6

Please send me my copy of
"CUTTING METALS THE EASY WAY".

NAME _____

COMPANY _____

STREET _____

CITY _____ STATE _____

MY DISTRIBUTOR IS _____

CIRCLE INFORM-A-GRAM KEY NO. 126

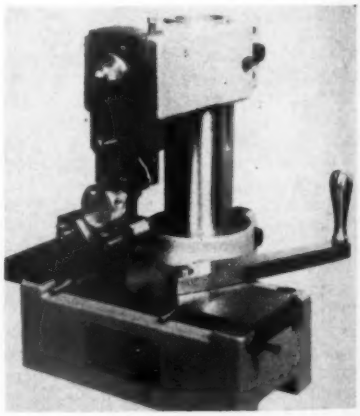
handling of plastic components, frequent washing, and glass fiber handling equipment will tend to minimize the possibility of dermatitis, sometimes involved with plastics.

• Resins in their original state, without fillers, have inherent natural colors; phenolics vary from a creamy tan to orange-brown, epoxies are usually amber, and polyesters vary from water white to light yellow. When fillers are added they pigment the resin to some extent, depending on the percentage of loading and the type. Silica flour will tend to lighten the darker resins. Metallic fillers, such as iron or aluminum will generally impart a metallic sheen to the plastic.

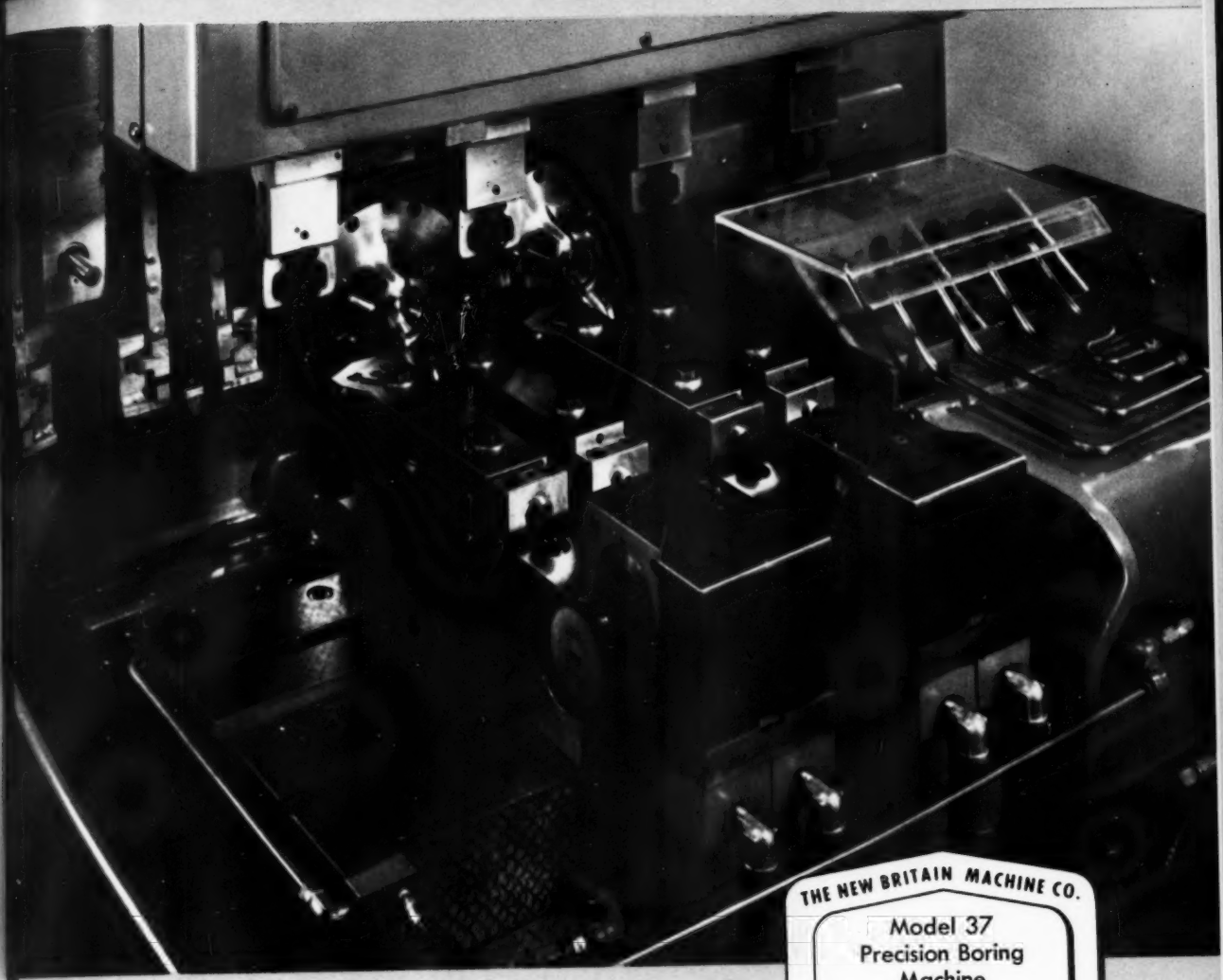
• Some plastic tools are built-up with a surface of gel coat, when this is done it has been expedient to have the surface one color, and the back-up resin another color. With this system, the surface coat thickness can be measured from time to time, and the die wear indicated. Color control can also be used to designate where that particular tool fits into a keyed pattern of operation, or procedure.

Introduces Small Marking Machine

This small bench model roll marking machine will perform permanent marking of either round or flat workpieces which do not require the pressure or size capacity of heavier floor models. Model 420 is the first of the new Series No. 7 machines that has been announced by The Noble & Westbrook Mfg. Co., East Hartford, Conn.

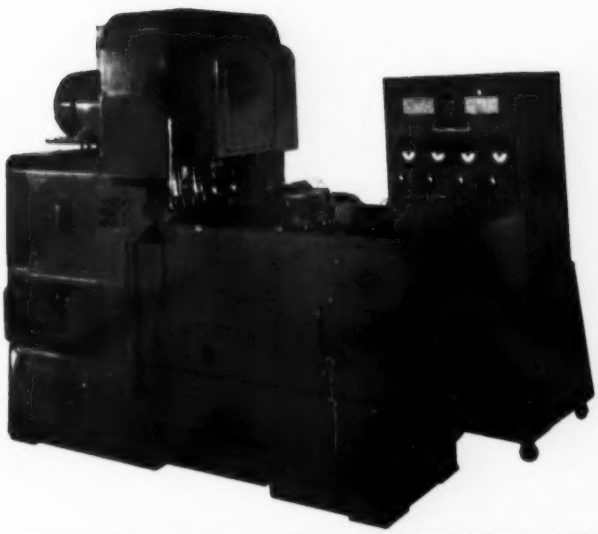


Model 420 features a hand operated work slide and rigid die holder head. The die holder head is vertically adjustable, which makes it possible to vary the gap for large or small workpieces. The die holder slide is also adjustable for setting depth of mark. An air operated head will be introduced soon. **Circle No. D3.**



this is the boring machine that thinks

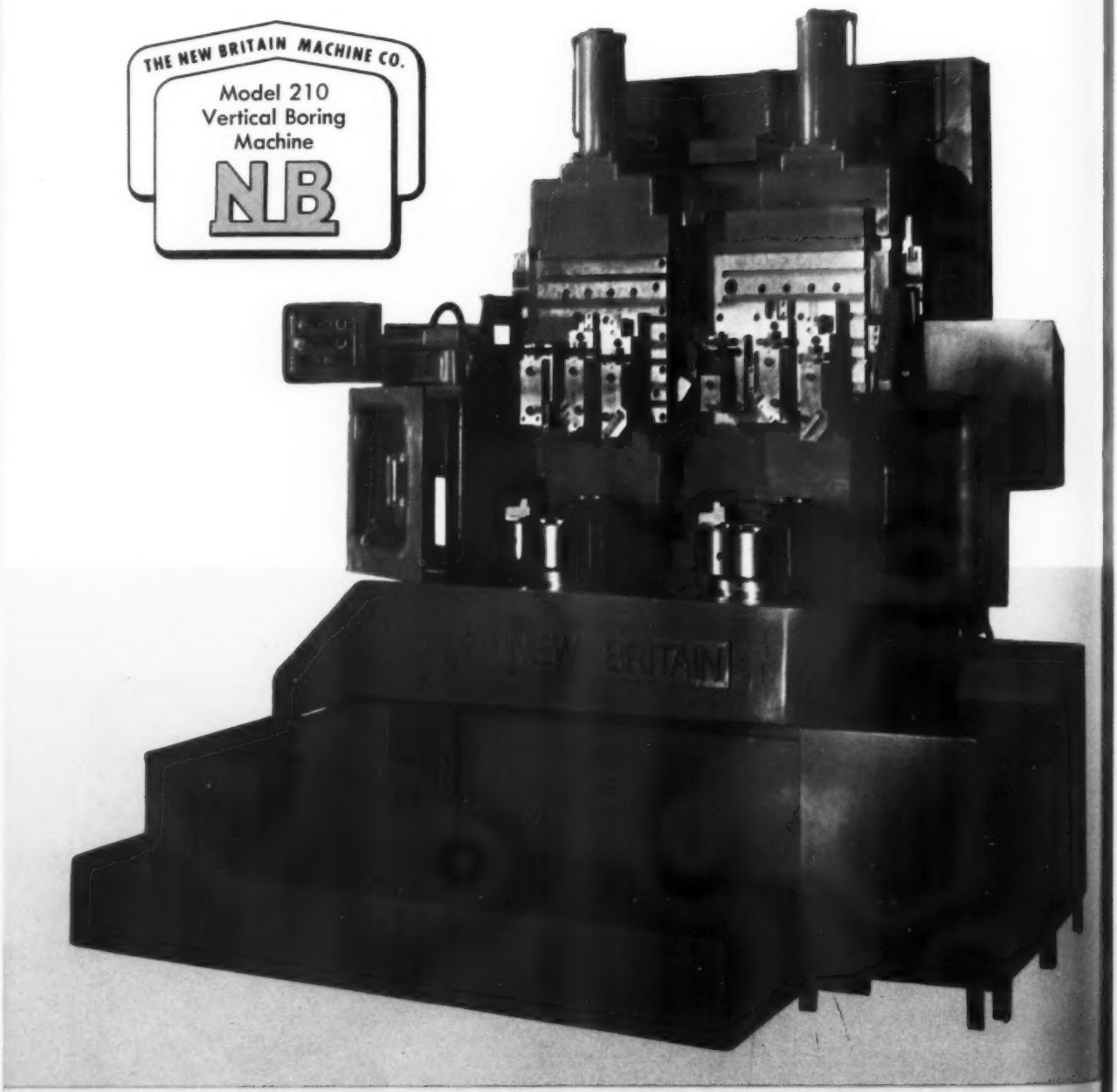
As successive pieces approach the limits of a ±.00025 inch tolerance, the tools reset themselves to size. With automatic loading, automatic gaging and two-at-a-time production, this and other New Britain Precision Boring Machines can cut costs for you. Please turn the page for more about New Britain Boring Machines.



verticals

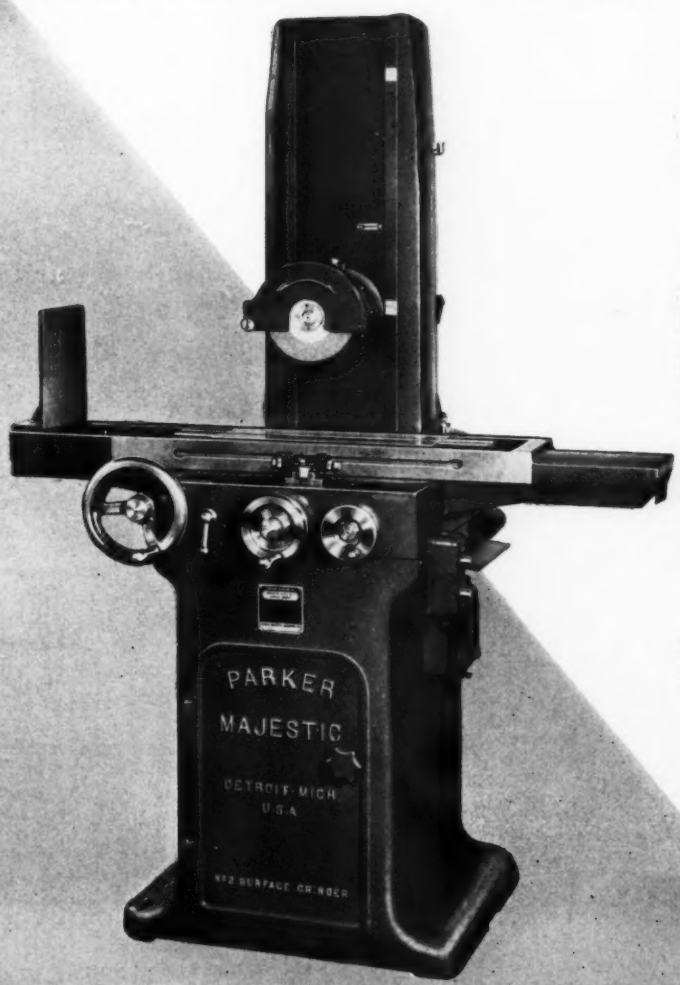
too!

New Britain builds a complete line of straight and contour boring machines, including double-end models, and this Vertical Precision Boring Machine for contouring and turning large parts to close tolerances. More and more the New Britain Sales Representative is your best bet for new and progressive metal-working methods. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



PARKER • MAJESTIC PM PRECISION MACHINES

NO. 2-Z SURFACE GRINDER



Elevating hand wheel mounted in saddle.
Motorized drive for rapid spindle elevation.
Handwheel graduated directly in .0001″ increments.

DESCRIPTIVE LITERATURE ON REQUEST

PARKER-MAJESTIC, Inc.
147 JOS. CAMPAU, DETROIT 7, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 129

STANDARDIZED AUTOMATION!

Standard 12 stop Intermittor with specially jig-bored 36" dial.

PRECISION INDEX TABLES FOR HIGH SPEED PRODUCTION

CAN YOUR PRESENT MACHINERY PRODUCE 30,000 PIECES AN HOUR?

Few production machines can . . . but it's possible with the Ferguson Intermittor Index Table. There are models capable of 30,000 indexes an hour if your machinery and tooling can keep up with them. The point is *. . . the Intermittor does not limit the speed of your machinery the way geneva driven or air or hydraulic operated tables do.*

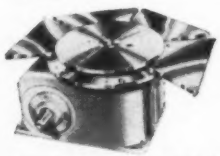
Perhaps speed is not your problem, but excessive maintenance costs are . . . resulting from the clanging, banging and jarring you get from a geneva drive. Here again you find the solution in an Intermittor. Employing modified trapizoid acceleration characteristics, the Intermittor has an initial acceleration point of zero with a gradual increase to the maximum and an equally gradual decrease to zero again . . . *all of which means that the Intermittor is a smooth operating table with minimum shock and vibration.*

Or maybe you like accuracy . . . but don't like shot pins. The Intermittor Indexing mechanism has an accuracy of .001" with zero backlash — *and no shot pins!*

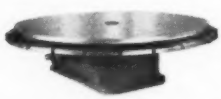
There are many more reasons why you should install an Intermittor when you need a rotary table for large volume production, including the fact that you can select one of 150 standard models from a catalog and get exactly what you need in terms of dial size, number of stations and indexing period.

OVER 150 STANDARD MODELS TO CHOOSE FROM:

Standard 24 station Intermittor with 30" dial and optional stationary tooling plate above the dial.



6 station Intermittor with 12" dial and special tool mounting brackets.



Standard 18 station Intermittor with 48" dial.

Send for our Catalog No. 300 . . . it has a definite place in your file if you have the responsibility of speeding up production or converting to automation.

ferguson

FERGUSON MACHINE & TOOL CO., INC.

ROLLER GEAR DIVISION, DEPT. HI-6 P. O. BOX 5841, ST. LOUIS 21, MO.

CIRCLE INFORM-A-GRAM KEY NO. 130

FAST, POSITIVE HOLE LOCATOR

Production drilling, where a variety of operations is to be performed, usually on a multiple spindle drill press, is nicely facilitated by an ingenious development of Howe & Fant, Inc., their Universal Positioning Table.

Although its advantages are great when used with conventional machines, this fixture-holding table is especially effective in its purpose — the saving of time and the simplification of operations — when used in conjunction with Howe & Fant's turret drilling and tapping machine. This machine has six spindles, all arranged to be quickly and easily indexed to operate on the same vertical axis.

Relative to the Universal Positioning Table, the cleverly engineered, positive, repetitive positioning of workpieces is governed by an inexpensively produced hole-locating template. The hole-locating template which receives a locating pin, is easily mounted within the assembly, or conveniently stored while a different one is being employed.

The positioning table is centrally located under the machine spindle and clamped to the machine table. A top plate, which has tee-slots and dowel pins, supports and positively locates a work-holding fixture. By an air valve operating lever, a built-in pneumatic cylinder is employed to clamp the top plate in its successive hole-drilling locations.

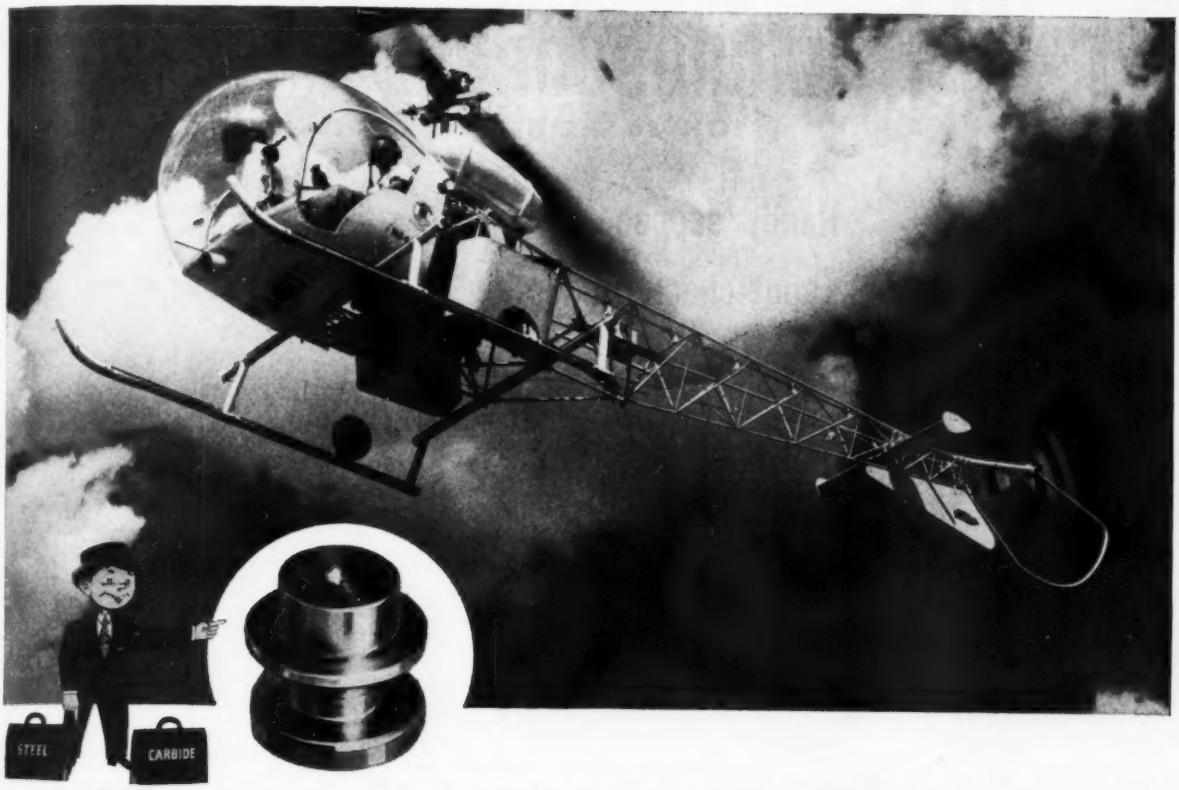
When unclamped, the top plate floats on ball bearings and is easily shifted to its next approximate position under the spindle as governed by the template. Positive positioning in line with the spindle and clamping are accomplished at the same time by the operating lever.

Simplicity, the key to good design, is evident throughout and particularly in the manner by which the end of the air cylinder shaft serves as the locating pin.

It can readily be seen that guide bushings for spindle tools may in many cases be eliminated because accurate alignment is assured.

Positioning tables are available in 3" and 6" sizes. The size indicates the diameter of the circle in which the pattern of hole centers must lie. **Circle Inform-A-Gram No. D1.**

"Mission accomplished" at Bell Aircraft...with FIRTHITE TXH



133% more needle bearing pins per grind

Down Fort Worth way at famous Bell Aircraft Corporation, they made production tests on the *new* FIRTHITE TXH Carbide . . . turning and facing needle bearing pins from SAE 4140 steel.

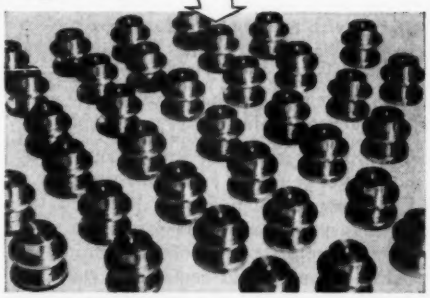
The results speak for themselves:

- 133% more bearing pins per grind.
- More than twice as many pieces per grind as nearest premium grade.
- Seven times more pieces per grind than two other competitive grades.
- Only .007 stock removed to resharpen compared with .025—.035 for competitive grades.

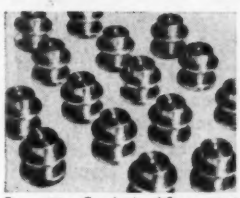
Truly this test proves, as do others all over the country, that FIRTHITE TXH is easily the outstanding carbide in its field . . . a *premium grade* at *no* premium price.

Yes, FIRTHITE TXH is a completely *new* carbide concept . . . a combination of materials and processes designed specifically to do heavy-duty, high-production cutting operations better than they have ever been done before!

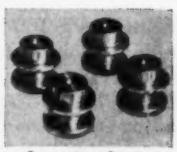
You, too, can make important savings, and increase production with TXH. It's available *now* in all standard tips and tools. Try it today.



FIRTHITE TXH—35 PER GRIND



Competitive Grade A—15 per grind



Competitive Grades B & C—4-5 per grind

R 316

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

CIRCLE INFORM-A-GRAM KEY NO. 131

NEW! BAUSCH & LOMB WIDE FIELD MACROSCOPES 10X to 40X

Handy 'scopes spot-check production, speed small parts work

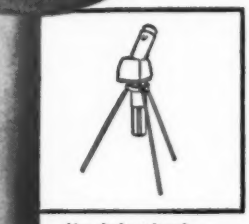
- **Actual size as shown here ... compact, handy**
- **Shows natural right-side-up views... easier for inexperienced users... a big help in precision assembly!**

Just grab this dependable inspection aid for on-the-spot checks of work and materials in any phase of production. Available with folding tripod or sturdy microscope stand, for detailed study and for small-parts assembly. You can even build it right into production machinery!

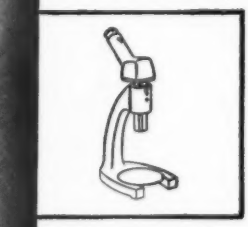
Upright images are sharp and detailed to the very edge of the extremely wide field of view. Long working distance makes it easy to manipulate specimens ... gives operators plenty of room for precision assembly and repairs. (Also available as straight tube for applications where upright image is not required.)

FREE DATA BULLETIN!
ON-THE-JOB DEMONSTRATION!

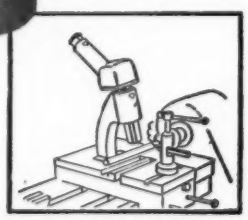
Find out how this inexpensive production tool can lower your manufacturing costs. WRITE, WIRE or PHONE today for free demonstrations and Data Bulletin D1052. Bausch & Lomb Optical Co., 79806 St. Paul St., Rochester 2, N. Y. (Phone: LOcust 3000).



Use it in tripod...



in microscope stand...



... or even built into machinery!

BAUSCH & LOMB
SINCE 1853

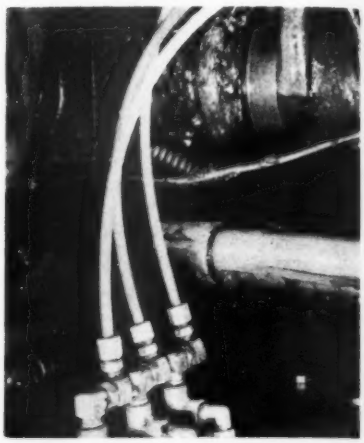
AMERICA'S ONLY COMPLETE OPTICAL SOURCE
... FROM GLASS TO FINISHED PRODUCT

CIRCLE INFORM-A-GRAM KEY NO. 132

Tubing Life 25 Times Greater

Flexible nylon tubing increases service life; nylon tubing practically eliminates downtime for tubing replacement; nylon tubing can be smaller — thus saving space by simplification of fittings and connectors.

This versatile tubing, Nylaflow, was engineered by The National Can Co. for use on their "Body-Maker" machines and their automatic punch presses.



The "Body-Maker" operates at high speeds, turning out 400 can bodies/min. This rate of operation and the machines' complexity necessitate continuous lubrication to prevent wear. Nylaflow can withstand these 400 flexures/min. Records show over 100,000,000 flexes without replacement. This represents a substantial material savings and greatly reduced maintenance costs.

It is interesting to note that the nylon tubing is also used for conveying a liquid plastic spray material. The National Can Co. coats the interior of their cans with plastic.

Nylaflow in the ¼" OD size has the low minimum bend radius of 2½". It has a burst rating of 2500 psi; the tubing will retain much of its strength at temperatures up to 475° F; it is unaffected by alkalis and practically all solvents; it is impervious to oil, gasoline, grease, and hydraulic fluids.

Nylaflow is supplied by The Polymer Corp., 125 N. Fourth St., Reading, Pa.

Newest entry in the new and rapidly expanding field of titanium is Johnston and Funk Titanium Corp., Wooster, Ohio. The firm is now producing specialty titanium wire and is building its production capacity to fit the distinctive needs of titanium.

BURGMASTER®

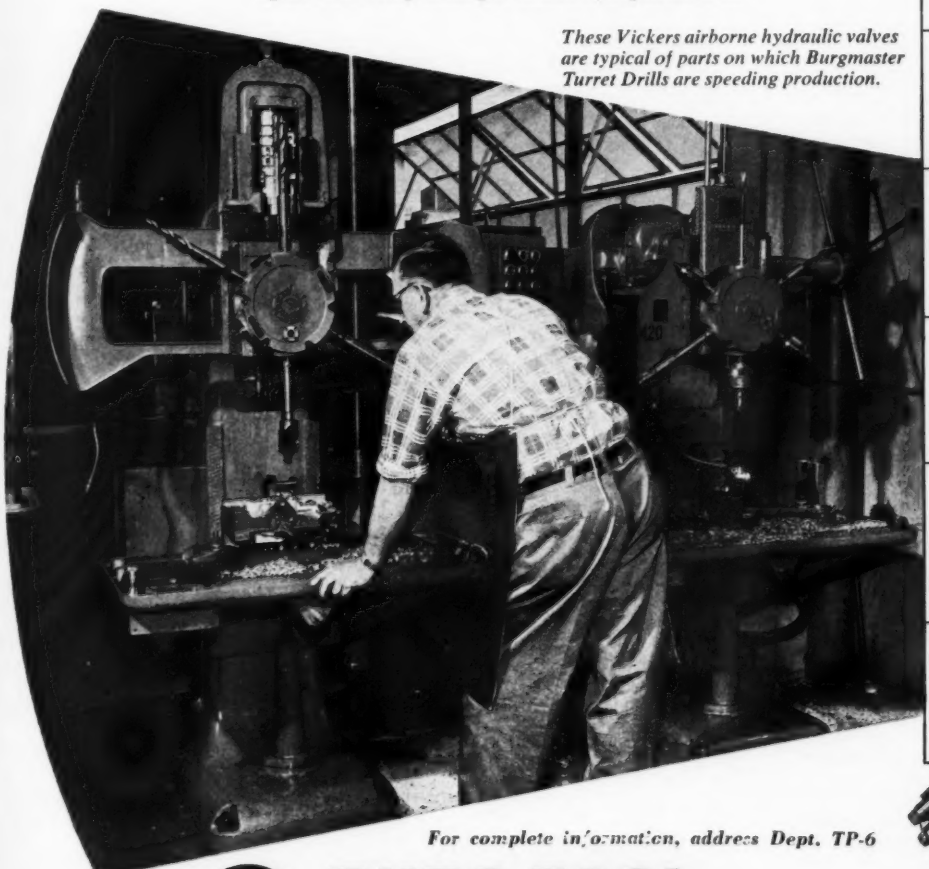
POWER INDEXING

Turret Drills

step up AN porting operation 25% at Vickers, Incorporated

Vickers, Inc., Div. of Sperry Rand Corp., El Segundo, Calif., manufacturers of hydraulic equipment, use both hand-operated and automatic hydraulic Burgmaster Turret Drills in their production lines. The company states that the AN porting operation on hydraulic valves has been stepped up approximately 25% over the old single spindle method. Vickers have found that the Burgmasters maintain sizes accurately, are easily set up, and perform multiple operations (drilling, reaming, counterboring, tapping) in one set-up, with one operator—automatically.

Automatic hydraulic Burgmasters (6 and 8 spindle models) feature skip indexing, automatic cycling and infinitely variable preselective feeds. All models (including the 6 spindle manuals) provide power indexing, pre-selective spindle speeds and very close pre-selective depth control.



These Vickers airborne hydraulic valves are typical of parts on which Burgmaster Turret Drills are speeding production.

Constant Gain Nose Wheel Steering Valve
Hydraulic Motor with Anti-Overrun Flow Control
Flow-Sensitive Pressure Regulator
Relief Valve with Thermal Protection
Power Control Flow Regulator
Motor with Constant Speed Valve

For complete information, address Dept. TP-6

BURG TOOL
Manufacturing Company, Inc.
15001 South Figueroa Street, Gardena, California
Sales Office: New York · Chicago · San Francisco

CIRCLE INFORM-A-GRAM KEY NO. 133

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Replace Coil Springs in Die Applications with Taylor liquid springs. One liquid spring delivers the same total end force as 10 heavy-duty standard die springs of the same size. These springs are advantageous where weight or space is a problem and can be used with coil springs as they have the same dimensions and stroke but greater force. The complete line is described in Catalog LS released by Taylor Devices Inc., 188 Main St., North Tonawanda, New York, or — **Circle No. B1.**

Lift Heavy Loads with Ease with the Type-DX Shoplifter. This lifter is available in capacities of 1000 lbs or 2000 lbs. It can be used to handle molds and dies, to lift skid loads and shop equipment, to move heavy machinery and castings, etc. For further details and specifications, get Bulletin SP-562 from Economy Engineering Co., 4515 W. Lake St., Chicago 24, or — **Circle No. B2.**

Increased Spindle Speed Range, reduced idle motion, and air-operated spindle head clutch are features of the 2½" Model "AW" Cleveland Automatic. Efficient cutting speeds for every kind of metal and for all types of cutting tools are provided by the 40 spindle speeds ranging from 69 to 1920 rpm. Read all about the machine in a bulletin from The Cleveland Automatic Machine Co., Cincinnati 12, O., or — **Circle Inform-A-Gram No. B3.**

A 25" Swing is a feature of Model E-25 drilling machine. It has a variable speed drive from which the speed can be obtained for any size drill from ⅛" to 1". The machine is suited for high speed production and maintenance work. Catalog 69 giving a description, specifications, and construction features, is supplied by Sibley Machine & Foundry Corp., 206 E. Tutt St., South Bend 23, Ind., or — **Circle No. B4.**

The Deublin Hi-Speed Coolant Union has been produced for gun drilling and gun boring operations. The coolant union introduces coolant under high pressure which effectively cools the cutting edge of the tool and flushes chips from the hole. Crodian & Co., 4897 Kessler Blvd., East Dr., Indianapolis 20, will provide copies of Bulletin D-563 giving details on the coolant union, or — **Circle Inform-A-Gram No. B5.**

Conveyors, Engineered Material Handling, and Automated Production Systems are covered in Bulletin 156 from Allied Steel and Conveyors, 17345 Healy Ave., Detroit 12. The bulletin shows a few examples of the company's scope and performance in helping to answer material handling demands from beginning to end. Each of the various types of equipment is shown and explained. **Circle Inform-A-Gram No. B6.**

Designed for Mechanical Power Press Operation is the new model of the Danly dual air valve. This valve eliminates accidental stroking due to valve failure. Its construction offers longer operating life, greater accessibility, and easier maintenance. The dual air valve is described and illustrated in Bulletin 1902B available from Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or —**Circle Inform-A-Gram No. B7.**

ARMSTRONG

The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Saves: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy ARMSTRONG TOOLS from your Industrial Distributor

ARMSTRONG BROS. TOOL CO. "The Tool Holder People" 5220 W. ARMSTRONG AVENUE CHICAGO 30, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 134

PREVIEWS

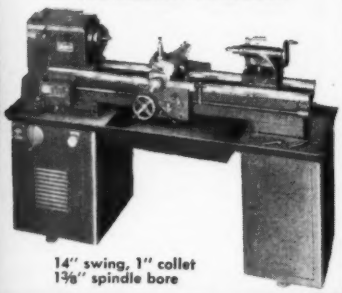
Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Air Presses are featured in a catalog from Famco Machine Co., 3100 Sheridan Rd., Kenosha, Wis. Both single acting and double acting presses are described and the various types of each shown. The features are pointed out on the basic models of the 200 and 400 Series. Tables show air compressor requirements and the compressor horsepower required. **Circle No. B8.**

Tool, Die, and Machine Shop Supplies are covered in a revised price list from The Die Supply Div'n, E. W. Bliss Co., 1400 Brookpark Rd., Cleveland 9. Included are various types of screws, Allenuts, stripper bolts, dowel pins, hex keys, Dickerman automatic feeds, feeler and shim stock, clamps, springs, etc. Each item is shown complete with ordering information. **Circle No. B9.**

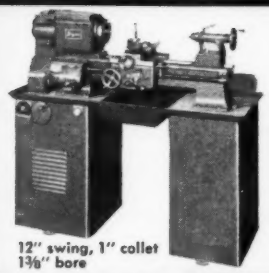
Logan
THE LATHES FOR SUSTAINED ACCURACY



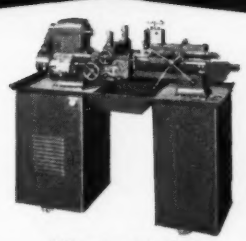
14" swing, 1" collet
1⅜" spindle bore

You can continue to depend on Logans for precision results. On every type of lathe operation Logan sustained accuracy keeps performance at top efficiency. Ruggedly proportioned as well as precision built, Logan Lathes keep their accuracy after years of use in tool room, shop or production.

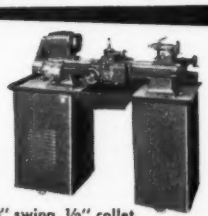
Screw Cutting and Turret Lathes In a Wide Range of Sizes 9", 10", 11", 12" and 14" swing, all with Logan advanced design features.



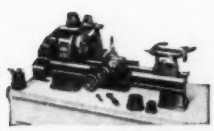
12" swing, 1" collet
1⅜" bore



11" swing, 1" collet
1⅜" bore



10" swing, ½" collet
25/32" bore



9" swing, ½" collet
25/32" bore

See your Logan dealer, or write for catalog information.

LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 135

Facts and Figures of various comparison, strength, and flexure tests performed on Pennsylvania black diabase granite used for surface plates are contained in a 4-page folder. For your copy of this folder and information and prices on a complete line of surface plates, angle and layout plates, straightedges, parallels, and Bonded Composite Constructed surface plates, write Lawley Granite Surface Plate Co., 2000 Wyoming Ave., Wyoming, Pa., or — **Circle Inform-A-Gram No. B10.**

Clean Metal Parts or Products with an automatic water washer developed by Stoelting Bros. Co., Kiel, Wis. This machine provides a continuous straight-line automatic work flow through the cleaning process. Each washer is designed to meet the space requirements of the purchaser. It can be used as a single conveyor unit or for multiple belt operations. Details on the washer are found in the bulletin, "Automation in Cleaning Metal Parts or Products," provided by the company . **Circle Inform-A-Gram No. B11.**

Dynamaster Electronic Potentiometer and Bridge Instruments for recording and controlling are included in Bulletin P1245A published by The Bristol Co., Waterbury 20, Conn. The 64-page bulletin is divided into 3 sections. The first gives details of the instrument and its components, the second lists sensing elements and special attachments, and the third describes and illustrates other manufacturers' equipment into which Dynamasters have been incorporated. **Circle Inform-A-Gram No. B12.**

Increase the Tool Life of any single point carbide tool from 200% to 700% with the Di-Met Carbide Microinch Finisher. The finisher produces ½ to 6 microinch finishes in 2 min or less. The uniform microinch finish on cutting tool edges allows faster cutting speeds, deeper cuts, and faster feeds. Di-Met Corp., 1873 Mullin Ave., Torrance, Calif., will provide copies of a bulletin telling about the finisher, or — **Circle Inform-A-Gram No. B13.**

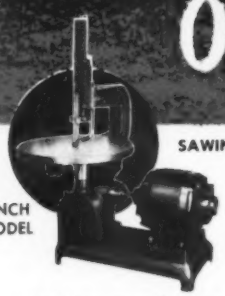
The New Airlox Power-Head is the subject of a circular issued by Production Devices Inc., Whitehall, N. Y. Given are the specifications of Model 400 power-head. It can be used for welding positioning, supplying power for fixtures, and making air vises. **Circle No. B14.**

The Complete Line of Burr-Master gear deburring and chamfering machines is featured in Bulletin BM-1 released by Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38. Illustrations, size dimensions, etc. useful in specifying machines, are included for 19 standard internal, external, and duplex models. Also detailed are 2 standard interference relief grinders for hypoid teeth and 6 special Burr-Masters for gears that present special deburring and chamfering problems. **Circle Inform-A-Gram No. B15.**

Off-Hand Grinding of standard and special single point carbide tools is performed by the Poweramic oscillating tool grinder. The oscillating wheel moves through a true arc at 150 strokes/min, the tool being held in a fixed position. Faster metal removal, hone-like finishes, and elimination of manual lateral tool movement are among the features illustrated and described in a bulletin detailing the grinder from Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, or — **Circle No. B16.**

"Miniaturization . . . More and More from Less and Less." This booklet shows how Standard Pressed Steel is making a continued effort to make precision fasteners, specialty parts, and pressed steel shop equipment lighter, smaller, and stronger. The topics covered include, Space Is Being Annihilated, Mathematics of Miniaturization, Miniaturization Is Contagious, Designing for Miniaturization, and Data and Materials for Miniaturization. Standard Pressed Steel Co., Jenkintown, Pa., will provide copies of Form 2132, or — **Circle Inform-A-Gram No. B17.**

OUTSTANDING!



BENCH MODEL

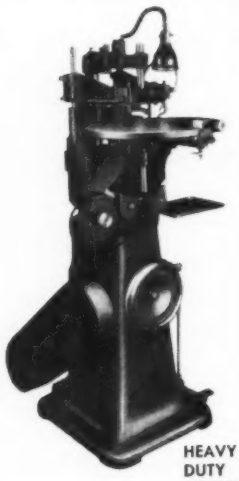
SAWING, FILING AND LAPPING OPERATIONS ARE BEST PERFORMED ON Oliver DIE MAKING MACHINES

Machines specified below will produce cost savings of 50 to 60 percent on expensive dies and gages. Over 40 years of experience has resulted in the production of the finest equipment available today.

SPECIFICATIONS			
	S-4 Bench Model*	S-1 Bench Model*	Heavy Duty Model
Capacity	Saws to center of 17" circle on steel up to 1" thick	Saws to center of 17" circle on steel up to 1" thick	Saws to center of 20" circle on steel up to 3" thick
Table	11¼" dia.	11¼" dia.	18" dia.
Tilt	10° to right, left or front	10° to right, left or front	15° to right, left or front
Strokes per minute	313 & 428	400	100, 125, 175, 215, 250 & 300
Length of stroke	1⅜"	1⅜"	0" to 5"
Drive	V-belt	Direct	V-belt

*Also available in pedestal models.

For proof of the economies produced by these machines please write for additional information.



HEAVY DUTY MODEL

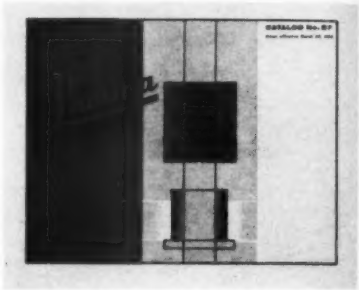
Oliver INSTRUMENT • COMPANY

1436 EAST MAUMEE OLIVER OF ADRIAN ADRIAN, MICHIGAN

FACE MILL GRINDERS • AUTOMATIC DRILL GRINDERS • DIE MAKING MACHINES
TOOL & CUTTER GRINDERS • DRILL POINT THINNERS • TEMPLATE TOOL GRINDERS

CIRCLE INFORM-A-GRAM KEY NO. 136

Designed to Cut Costs and Improve Efficiency in the building and use of die sets is the line of equipment produced by Lamina Dies & Tools, Inc., 14925 W. 11 Mile Rd., Oak Park, Mich. More than 800 items of the



Lamina line of guide pins, guide pin bushings, and accessories are shown in a 36-page catalog, complete with applications, dimensions, and prices. Get copies of Catalog B7 from the company, or — **Circle No. B18.**

Double Action Straight Side Presses ranging from 200-ton to 2000-ton capacity are shown in Catalog Series D published by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50. Included are 1-, 2-, and 4-point suspension presses. The special features of the presses are shown in detail. Bed-sizes up to 228" x 108" are presented with complete specifications and dimensions. **Circle No. B19.**

Increase Production up to 100% with a new conveyor-type abrasive-belt grinder. Model 680 is available with single, double, or any number of heads. The machine gives precision finishing to close tolerances on flat surfaces of any ferrous, nonferrous, plastic, or other material. The features and advantages of the grinder and specifications and photos are contained in Form A680 made available by The Engleberg Huller Co., Inc., 831 W. Fayette St., Syracuse 4, or — **Circle No. B20.**

A New Line of Slip Roll Forming Machines is described in Bulletin 77 provided by Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. These machines are equipped for

rapid forming of obround and rectangular parts. Both power and hand operated models are available with this optional feature. Also included is an explanation of the factors governing the selection and operation of slip roll formers.
Circle Inform-A-Gram No. B21.

30° Chamfering Operations on all types of material are performed by SDR-SDL band-type Multicut holders. These holders are also applicable in turning operations where a square shoulder is not required. A data sheet gives dimensions, prices, and a diagram of the holder. For copies of Data Sheet 955-2, contact Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, or —
Circle Inform-A-Gram No. B22.

Complete Carbide Tooling for Automatics is presented in Catalog 161 from Arthur A. Crafts Co., Inc., 603 Newbury St., Boston 15. Included are circular form tools; flat, dovetail, and skiving tools; cut-off tools; box and roller turner tools; end-cutting tools; and diamond dressers. The catalog is complete with illustrations, specifications, line drawings, and descriptions.
Circle Inform-A-Gram No. B23.

Set Up Work on a Surface Plate and true pieces in machine tools with a new test indicator. The Check Master will respond to dimensional variations as small as 0.00002". Three models are available with either long or short contact points. For more information and dimensional diagrams, get the "Check Master" bulletin from Standard Gage Co., Poughkeepsie, N. Y., or —
Circle Inform-A-Gram No. B24.

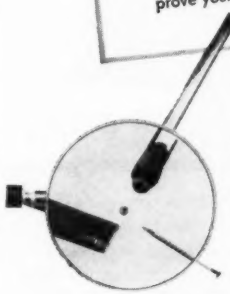
3-Dimension Contour and Profile Tracers are the subject of a folder from True-Trace Sales Corp., 9830 E. Rush St., El Monte, Calif. Model A-3D hydraulic tracer is a precision, pencil-type instrument which controls the longitudinal, cross, and vertical feed movements of a machine tool so that a 3-dimensional part can be reproduced. It can be applied to vertical mills, planers, shapers, etc. Also described in the folder are Models A-360 and 1-180.
Circle Inform-A-Gram No. B25.

Production Center-Drilling, Drilling, and Boring are performed by a precision hole borer. This machine method is 8 times faster than conventional jig boring methods and assures guaranteed hole spacing accuracy within 0.0001" and bore accuracy within 0.0001". The method permits precision hole boring on repetitive pieces at high speeds. Complete information is found in a bulletin from The Canton Tool Mfg. Co., East Canton, O., or —→
Circle Inform-A-Gram No. B26.

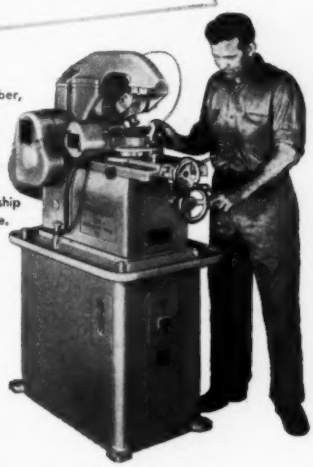
PRECISION GEARS

YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.

YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.



The Hamilton Precision Gear Hobber, the hobber with a "reserve of accuracy," regularly holds work spindle and hob spindle runout to less than .0002", workspindle and tailstock spindle alignment to less than .0002", and this workmanship is maintained throughout the machine.



WANT FACTS?
Write for Bulletin No. 5419.
Address The Hamilton Tool Company
832 South Ninth Street,
Hamilton, Ohio.

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

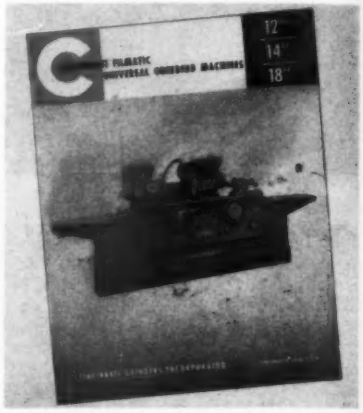
CIRCLE INFORM-A-GRAM KEY NO. 137

Production Bulk Handling of small parts is possible with Powell Flow-Mation Systems. The system is based on a movable work level stand with hopper box arrangement. The system can be designed to meet any job requirement. Bulletin FM introducing the initial units of the line is available from The Powell Pressed Steel Co., Hubbard, O., or —
Circle Inform-A-Gram No. B27.

Accurate Grinding of Straight or Tapered Pieces is simplified by the Electralign for electronic alignment of the swivel table. The device is used for speedy, accurate table setting. The Electralign is applicable to many machines. Details on the Electralign, its features and uses, and the comparator selector which can be used with the device, get Bulletin GM4 from Brown & Sharpe Mfg. Co., Providence 1, R. I., or —
Circle Inform-A-Gram No. B28.

Anti-Friction Bearings for Special Applications are highlighted in Catalog AFB-1 prepared by Industrial Tectonics, Inc., Ann Arbor, Mich. Dimensions and load ratings are given for single row, double row, deep groove radial, and angular contact bearings. In addition, general bearing requirements for special designs, high and low temperatures, corrosion-resistant and non-magnetic properties, and electrical conductivity and insulating features are discussed.
Circle Inform-A-Gram No. B29.

Filmatic 12", 14", and 18" Universal Grinding Machines are highlighted in a new catalog. They are suited to straight cylindrical, taper, bevel, shoulder, chuck work, internal, and face and rotary surface grinding. The bulletin details their design, features, and headstock. Also



given is an index to operating controls, general specifications, dimensional drawings, and a list of extra equipment. Cincinnati Grinders Inc., Cincinnati 9, O., will provide copies of Catalog G-663, or —
Circle Inform-A-Gram No. B30.

41 Colloidal and Semi-Colloidal Dispersions for operational functions, maintenance, lubrication, machine design, etc., are listed in a 4-page booklet. These products include dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc oxide, and acetylene black. Carriers and diluents are given for each along with typical applications. Copies of "A List of 'dag' Dispersions for Industry" are available from Acheson Colloids Co., Div'n of Acheson Industries, Inc., Port Huron, Mich., or
Circle Inform-A-Gram No. B31.

For Faster, More Economical Forming and Retruing of complex forms on grinding wheels, use the Diaform wheel forming attachment. Model No. 10 universal Diaform is a light-weight portable attachment designed for use on standard cylindrical grinders, tool and cutter grinders, and universal and internal grinding machines. Circular 596 detailing the attachment complete with photos of actual applications, can be obtained from Pratt & Whitney Co., Inc., West Hartford 1, Conn., or —
Circle Inform-A-Gram No. B32.

Keep a handy NORBIDE® Stick in your tool box . . .

To form, dress or touch up wheels *in a jiffy*

GET one of these light, easy-to-grip, dressing sticks from your local NORTON distributor and keep it handy in your tool box. You'll find it's just what the doctor ordered for cleaning up a wheel face, forming a radius or touching up a tool wheel in a jiffy.
With a NORBIDE Dressing Stick you can see more of the wheel face and avoid costly overdressing. And it will greatly reduce dust nuisance too.
Better yet, a NORBIDE Stick of Boron Carbide — the hardest man-made material commercially available — will outlast hundreds of ordinary sticks. Order one today or write for Form 1567 giving more details.

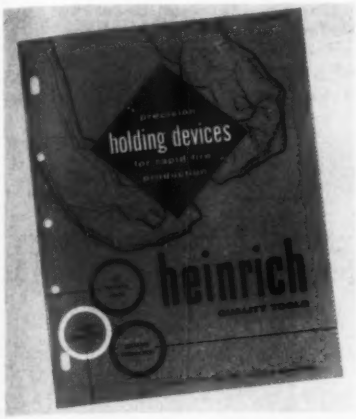
NORTON COMPANY, 47 New Bond St., Worcester 6, Mass.

NORTON BORON CARBIDE

Next to the diamond in hardness . . . available at a fraction of diamond cost

CIRCLE INFORM-A-GRAM KEY NO. 138

Money-Saving Tips for solving tooling problems are contained in a catalog issued by Heinrich Tools, Inc., 1536 Clark St., Racine, Wis. The complete Heinrich line is described. The application of "Grip-Master" vises as jig and fixture bases



is emphasized. Specific examples are cited to illustrate the savings gained through the use of the products. Get copies of Catalog 156 from the company, or —
Circle Inform-A-Gram No. B33.

Full Selection and Application Data on high speed indexing mechanisms is found in Catalog 106 from Ferguson Machine & Tool Co., P. O. Box 5841, St. Louis 21, Mo. Included are methods of calculating load requirements, load ratings based on a minimum of 8000 hrs operation without maintenance, and dimensions of stock and standard Ferguson drives. The catalog also introduces the "Trans-Pac," a standard packaged power unit for indexing straight line assembly machinery.
Circle Inform-A-Gram No. B34.

Copper-Clad Laminates for printed circuitry have been introduced by International Resistance Co., 401 N. Broad St., Philadelphia 8. Bulletin AR-2 details the new laminate which features very low cold flow, zero water absorption, and excellent machineability. The laminate is recommended for use under severe temperature, moisture, and electrical conditions. **Circle No. B35.**

Automation Gaging Systems are highlighted in Catalog 56 AM from Federal Products Corp., 1144 Eddy St., Providence 1, R. I. The catalog explains the 4 gaging systems used for automatic control and describes the components that make up each system. In addition, the various types of control gaging for automation are detailed. **Circle No. B36.**

Magnetic Grip-Shields will guard against flying chips, and dust and splashes which impede production and cause injuries. The shields feature a powerful Alnico permanent magnetic base, 2-way positioning arm, and Plexiglas tru-vision panels. For a brochure with the sizes and prices listed and showing typical applications, contact The Dilley Mfg. Co., 1680 Ansel Rd., Cleveland 6, or —**Circle Inform-A-Gram No. B37.**

Standard Mold Parts, Tools and Supply Items, and mold polishing supplies are included in a catalog issued by DME Corp., Div'n of Detroit Mold Engineering Co., 502 Brookpark Rd., Cleveland 9. Each item is shown and described, and prices and ordering information given. **Circle No. B38.**

Cut Checking and Inspection Costs by as much as 90% with a self aligning angle finder. This protractor will check all angles on single point tools, including the top and side clearance. For further details on the instrument, write to KP National Sales, 1036 Terrace St., Muskegon, Mich., or —
Circle Inform-A-Gram No. B39.

PORTELVATOR®
The Handy HAMILTON Portable, Elevating Table

A PORTABLE HEIGHT-ADJUSTABLE TABLE
● TRUCK
● WORK BENCH

for
DIE TRANSFER
● MACHINE FEEDING
● ASSEMBLY AT BEST HEIGHT IN BEST LIGHT

LIFTING
● LOWERING
● TRANSPORT
of
SHEETS
PLATES
BARS
TUBES
PIPES
TOOLS
DIES
FIXTURES
●
ALL
COMPACT HEAVY
LOADS

UNOBSTRUCTED PERIMETER
●
WORK FROM ANY SIDE

MORE SERVICE for LESS MONEY than ANY Other Unit of Equipment

43 table surfaces
point support

LIFT LOWER TRANSPORT

FOUR-WHEEL and SIX-WHEEL MODELS

Recent changes and additions to the line provide greater capacities, new flexibility, many bonus features.

Write for NEW, FREE Bulletin P-5604

Address THE HAMILTON TOOL COMPANY,
832 South Ninth Street, Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE
5604

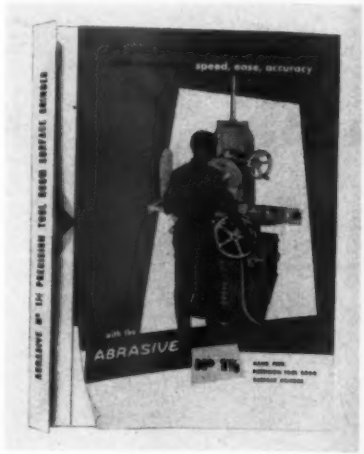
CIRCLE INFORM-A-GRAM KEY NO. 139

The Specifications for the new high titanium, nickel binder grade 330 finishing carbide are covered in Bulletin GT-311 from Carboloy Dept. of General Electric Co., Detroit 32. Included are details on round, angular, and square throw-away inserts; and blanks for cylindrical and square boring tools. The prices are also given for the new material.
Circle Inform-A-Gram No. B40.

Flexible Shafts and Machines are highlighted in Section "F" of Master Catalog from Jarvis Corp., Middletown, Conn. Each type of machine is illustrated, described, and its specifications listed. In addition, assembly detail, and dimensional, engineering and maintenance data are given. Also included is a section on flexible shafts and machine parts.
Circle Inform-A-Gram No. B41.

Precision Measurement of pressure, tensile, or torque is performed by the Model X mechanical force gage. The instrument is designed to check such loads even in very limited space. It can be used alone or incorporated in special testing devices. For a copy of Bulletin 11E with "how to do it" photos and pertinent dimensions, write to W. C. Dillon & Co., Inc., P. O. Box 3008, 14620 Keswick St., Van Nuys, Calif., or — **Circle No. B42.**

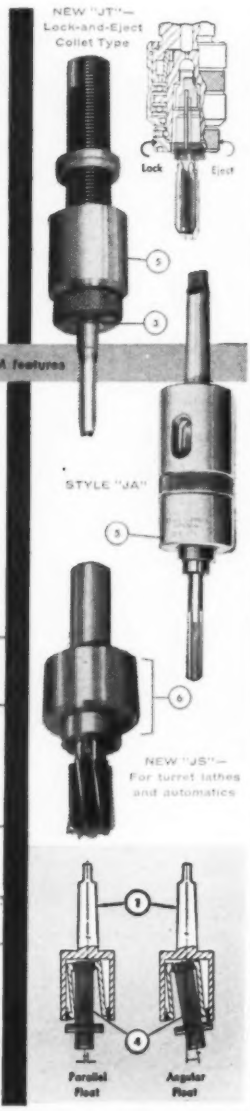
The No. 1½ Hand-Feed Precision Surface Grinder is described in a new catalog from Abrasive Machine Tool Co., E. Providence, R. I. The catalog shows how the grinder handles big tool room jobs, grinding deep with accuracy and flat every time. In addition, the design features and attachments are covered.
Circle Inform-A-Gram No. B43.



An Economical Modern Way to Monitor Remote Temperatures is with the Edison Omniguard System. The indicating and alarm system is used to protect against excessive temperatures in critical spots in bearings, gases, and liquids. Plug-in monitor units are grouped according to individual requirements to give warning before the temperature reaches the danger level. For further details, obtain Bulletin 3036A from Thomas A. Edison, Inc., Instrument Div'n, West Orange, N. J., or — **Circle Inform-A-Gram No. B44.**

Applications; Physical, Chemical, and Mechanical Properties; and preparation of molybdenum carbides and nitrides are summarized in a 6-page bulletin. Covered are Mo_2C and MoC molybdenum carbides, and Mo_2N and MoN molybdenum nitrides, and multicarbide systems. These refractory materials are of value in cutting tools and hard-surfacing applications as bearing surfaces and die facings. Get your copy of Bulletin Cdb-7, "Refractory Molybdenum Carbides and Nitrides," from Climax Molybdenum Co., Dept. L., 500-5th Ave., New York 36, or — **Circle No. B45.**

You buy Scully-Jones
"PREMIUM FEATURE"
FLOATING HOLDERS
AT NO PREMIUM
IN PRICE!



These benefits . . .	for these reasons . . .	result from these PREMIUM features
HIGHER QUALITY WORK	No "binding" or dead spots to cause bell-mouthed, out-of-round, or poorly finished reamed holes. No oversized or tapered threads when tapping.	1-Exclusive double-gear spline drive provides a balanced, constant velocity, and a flexible drive coupling which permits freedom of lateral or angular movement.
LOWER CUTTING TOOL COSTS	No "cramping" to break fine cutting edges.	2-Two thrust bearings placed close together and independent of drive, as well as proper clearance in the spline, allow tool to float freely and quickly into proper alignment.
INCREASED PRODUCTION	Less downtime due to cutting tool breakage.	
	Tool changes are fast and easy.	3-New Lock-and-Eject Type Chuck (Style "JT" only) eliminates need for conventional-type drift.
LOWER MAINTENANCE COSTS	Positive, self-lubricating action practically eliminates wear.	4-"Rocking" action with spline drive coupling causes continuous flow of lubricant in and out of splines, and cushions drive against torsional shock and overload. Shell houses floating and driving elements, and acts as perfect seal for lubricant.
LOWER TOOLING COSTS	Holder may be used for most close-center and multiple-spindle operations.	5-Small body diameter.
	Requires little space between spindle and work.	6-Minimum body projection (Style "JT" and "JS").

SCULLY JONES
Call your Scully-Jones factory-trained representative or distributor for complete information and prices.
PRECISION HOLDING TOOLS
"Precision Holding" for holding precision

Scully-Jones and Company, 1913 South Rockwell Street, Chicago 8, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 140

"Firlomet" Cemented Carbide Blanks are described in Catalog 2 released by Firth-Loach Metals, Inc., Buttermilk Hollow Rd., McKeesport, Pa. The brochure covers all styles of standard blanks as well as rectangular strips; pulley grooving and stone chisel blanks; blanks for reamers, lathes, and boring tools; and roll turning and milling cutter blanks. Also listed are special blanks and die inserts. **Circle No. B46.**

Simplify Automation on many production operations requiring ram pressures with a 1-ton Hydroilic Multi-Press. This is a completely self-contained bench model, ready to plug into an electrical outlet. It speeds up jobs like assembling, riveting, punching, marking, trimming, broaching, swaging, etc. Photos of actual applications, the features of the press, and its specifications are presented in Bulletin 310 provided by The Denison Engineering Co., Columbus 16, O., or —
Circle Inform-A-Gram No. B47.

Universal Cutter and Tool Grinders are the subject of Bulletin 125 from Covel Mfg. Co., Dept. TP, Benton Harbor, Mich. The bulletin describes the new Model 12A which is equipped with the Pope 1-hp direct motor-driven tilting swivel spindle.

Also covered is Model 12. The bulletin discusses the features, pictures typical setups, and lists the attachments and specifications for both models. **Circle No. B48.**

Filing, Sawing, and Lapping Operations are handled by the Keller die filer which is available in 3 models. The filers and accessories, parallel machine files, metal cutting saw blades, and abrasive stones and lapping sticks are detailed in Bulletin 256 from Sales Service Machine Tool Co., 2363 University Ave., St. Paul 14, Minn., or — **Circle No. B49.**

A Duplex Foot Treadle Switch can be adapted for starting and stopping motors and machines or control of forward and reverse motion. The switch features a wide choice of wiring hook-ups. For more information on the Linemaster Switch, contact Linesmaster Switch Corp., Woodstock, Conn., or —
Circle Inform-A-Gram No. B50.

The Operation, Uses, and Optional Features of Speed King pilot operated control valves are detailed in an illustrated 6-page bulletin. Also included are tables which cover types of service, pressure ranges, condensed specifications, and dimensions. Copies of Bulletin SK356 are supplied by Valvair Corp., 454 Morgan Ave., Akron 11, or —
Circle Inform-A-Gram No. B51.

Dryers for Compressed Air and Gasses are highlighted in a circular from Murphy & Miller, Inc., 1326 S. Michigan Ave., Chicago 5. The features and operating details of the automatically operating dryers are included. Also presented are model selection charts.
Circle Inform-A-Gram No. B52.

HAMILTON Varimatic®

SUPER SENSITIVE
VARIABLE SPEED • SMALL HOLE
PRECISION
drilling machine

SINGLE OR
MULTIPLE SPINDLES

to drill holes (.004" to 5/16") in all drillable materials, to the most exacting specifications and on the most relentless production schedules.

Get prices and specifications without obligation.

ASK FOR FREE BULLETIN 5407

Address The Hamilton Tool Company
832 South Ninth Street
Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO' 141

A Metallized Ceramic Coating for use with all types of hard solders is the subject of a 4-page bulletin. Molcote is a metal-to-ceramic coating presenting a surface to which a metal part or other metallized ceramic part can be hard soldered up to 2200°F. Get your copy of Bulletin 1155 from Frenchtown Porcelain Co., 160 Muirhead Ave., Trenton 9, N. J., or — **Circle No. B53.**

Save Setup Time and Increase Production with IMP "Hold-Down" vises. A brochure shows how difficult setup problems of milling and grinding non-ferrous metals can be solved quickly. It shows the features and applications of the vises and the models that are available. For copies of the brochure on IMP "Hold-Down" vises, write to Illinois Metal Products, 429 W. Superior St., Chicago 10, or — **Circle Inform-A-Gram No. B54.**

A Keyed Adjustable 90° Square Locator is a feature of the Whirl-Dex indexing and grinding fixture. The use of the locator eliminates expensive methods of centering square blocks and first grinding diameters before grinding sides. The fixture can also be used for locating plugs, pins, and other gages for proper location and maintaining concentricity while grinding without removing the fixture to indicate the gage to be ground. Karniotis Precision Products, Inc., 14847 Heyden, Detroit 23, will provide copies of the bulletin, "The New Whirl-Dex," containing details, or — **Circle Inform-A-Gram No. B55.**

11 New End Mills ground from the solid and the Uniflute carbide countersink are appearing for the first time in a cutting tool catalog issued by M. A. Ford Mfg. Co., Inc., 732 West River St., Davenport, Iowa. Catalog 601 also includes sections on HSS and carbide rotary files and cutters, countersinks, carbide end mills, and special tools. It lists all styles, shapes, and sizes in easy-to-read tables plus dimensions, angles, and operating data. **Circle No. B56.**

Radiochemicals . . . What They Are and How They Are Used. A catalog lists the radiochemicals that are available. It also discusses the fields in which radiochemicals are useful and provides ordering information. The catalog, "B & A Radiochemicals," can be obtained from General Chemical Div'n, Allied Chemical & Dye Corp., 40 Rector St., New York 6, or — **Circle Inform-A-Gram No. B57.**

A Flame-Hardened Column is incorporated into the 3"7½" Cincinnati radial drill. This drill features ease of operation and maintenance, extended range, retained accuracies, safe guards for operator and machine, and versatility and stability. A floor plan, specifications, and details on the drill are found in Catalog D-133-1 from Cincinnati Lathe and Tool Co., Cincinnati 9, O., or — **Circle Inform-A-Gram No. B58.**

The Malcomizing Process produces an intense superhard surface by the action of nitrogen with steel surfaces. A bulletin from Lindberg Steel Treating Co., 222 N. Laflin, Chicago 7, tells what the process is, how it works, and how it is done; the types of steel that can be Malcomized; and pretreating the steels. Also represented are tables showing case depths, relative wear test results, mechanical properties, grinding wheel recommendations, and the effects of various corrosive media. Also discussed are the applications of Malcomization and the company's facilities. **Circle No. B59.**

HEVI DUTY TOOL ROOM COMBINATION
FOR ALL HEAT TREATING OPERATIONS

This low cost combination consists of the "TEMPERITE" Air Draw Tempering Furnace, maximum temperature 1350° F.; "TREET-ALL" Multi-purpose Furnace, maximum 1850° F.; "SPEED TREET" High Temperature Furnace, maximum 2600° F.; and an "ATMO-GEN" atmosphere generator used to supply a protective atmosphere to the above furnaces. Furnaces and "Atmo-Gen" are available separately. Send for Bulletin HD 1147.

HEVI DUTY ELECTRIC COMPANY
HEAT TREATING FURNACES HEVI DUTY ELECTRIC EXCLUSIVELY
DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS
MILWAUKEE 1, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 142

Stupalox, a high-strength oxide cutting tool, is said to outperform other tools 2 to 10 times in machining rough castings, chiled iron, high-speed steel, and non-ferrous materials. A bulletin gives detailed data on a series of machining trials and lists the physical and mechanical properties. Copies of Bulletin 156 can be obtained from Stupakoff Div'n, The Carborundum Co., Latrobe, Pa., or — **Circle Inform-A-Gram No. B60.**

Phillips Recessed Lead Screws are the subject of a booklet issued by Recessed Screw Co., Inc., 426 Broome St., New York 13. Included are machine, tapping, wood, and thread cutting screws; and aluminum and stainless machine, tapping, and wood screws. In the general information section are tables giving dimensions, weights, platings and finishes, and driver bit sizes. **Circle Inform-A-Gram No. B61.**

Harduty Drills and Reamers are presented in a folder from Chicago-Latrobe, 411 W. Ontario St., Chicago 10. Harduty drills are carbide tipped and are designed for accurate drilling in hardened die steel, 45 to 65 Rockwell C. The drill sizes range

from 1/16" through 3/4" dia. The carbide-tipped reamers are recommended for use in hardened steel having a Rockwell 45 C Scale or harder and their sizes range from 1/4" through 3/4" dia. **Circle No. B62.**

Speed Production and assure accuracy in high production duplicating work with a profile tracing lathe attachment. Model M-1500 Lehigh Tracer-Tool is used to manufacture form rollers, swaging dies, punching and piercing dies, etc. A bulletin picturing actual applications and giving specifications and engineering data is supplied by Fred H. Schonberger, Inc., P. O. Box 233, Nazareth, Pa., or — **Circle No. B63.**

Single Spindle Automatic Screw Machines are highlighted in a bulletin from The Cleveland Automatic Machine Co., Cincinnati 12. The various models are shown with their specifications and features listed. A table gives a description of each model and tells the uses for the particular machine. **Circle No. B64.**

A Pitch Diameter Chart covers thread work plug gages and thread rings and setting plugs. The chart is supplied by Alameda Gage Co., 10851 Capital Ave., Oak Park, Detroit 37, producer of thread plug and thread ring gages, thread setting plugs, thread concentricity and thread relation gages, and threaded arbors. **Circle Inform-A-Gram No. B65.**

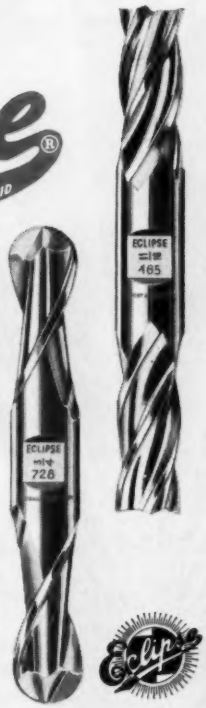
For Rapid Production of Mirror-Bright Finishes, use Di-Met diamond compound. Uniform diamond particle sizes with correct shapes insure high polishing speed and efficiency. The compound is discussed and illustrated and the features listed in a new bulletin issued by Di-Met Corp., 1873 Mullin Ave., Torrance, Calif., or — **Circle No. B66.**

COMPARE!
NEW
Eclipse®
PRECISION GROUND from SOLID
END MILLS with
Conventional
END MILLS

Our END MILLS have an entirely new and advanced flute design with an uninterrupted contour and hook from one flute to the next.

Flutes ground from solid hardened blanks with mirror finish allow a smooth flow of chips. Identical flutes as to dimensions and contour give a perfect distribution of cutting load. The form relieved land provides much greater strength to the cutting edge.

RESULTS: longer tool life, finer finishes, and lower production costs.



COPYRIGHT 1956

ECLIPSE COUNTERBORE COMPANY
DETROIT 20, MICHIGAN
END MILL DIVISION – NORTH BRANCH, N. J. (ADDRESS BOX 97, RARITAN, N. J.)

CIRCLE INFORM-A-GRAM KEY NO. 143

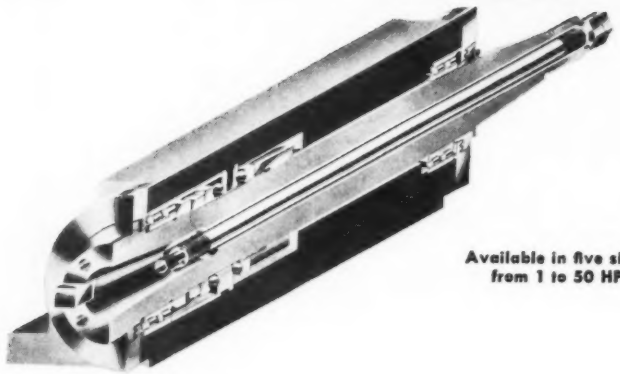
7 Styles and 56 Sizes of Dex-A-Tool toolholders for throw-away inserts are available. The parts are precision-made for positive interchangeability and accurate, rapid indexing. A catalog contains complete ordering information and a parts price list. Adamas Carbide Corp., Kenilworth, N. J., will supply copies of Catalog DT-156, or —
Circle Inform-A-Gram No. B67.

For Rapid Non-Destructive Measuring and Testing, use the Inspectogage. It is an ultrasonic resonance measuring device which gives visual indication of the thickness of materials, from one side of the work. The Inspectogage can measure most metals and other dense materials. Further details on Inspectogage Model 55 are found in a circular provided by Alcar Instruments, Inc., 17 Industrial Ave., Little Ferry, N. J., or — **Circle No. B68.**

The Practical Application of a punch card control system on Model 14 multi-cycle single point production lathe is detailed in a Sundstrand bulletin. The system reads a card that has been punched with the proper numerical dimensions and feeds electrical signals into the machine control unit. Sundstrand Machine Tool Co., Rockford, Ill., will supply copies of Bulletin 14P-1, or —
Circle Inform-A-Gram No. B69.

Your BEST PACKAGED BUY in milling spindles

POPE HEAVY DUTY PRECISION SPINDLES



Available in five sizes from 1 to 50 HP

POPE HEAVY DUTY MOTORIZED MILLING MACHINE SPINDLES are available in P-2500 Series, from 1 to 100 HP, totally-enclosed, fan cooled; also in high cycle, water cooled units.

P-12000 Series *Belt Driven* in sizes from 1 to 50 HP, with Standard milling machine tapers in the nose from #10 to #60. *Operable in any position you specify.*

See: the big shaft, the heavy duty double row cylindrical roller bearings and thrust bearings that have extra ability and the rigidity to support your cutting tools.

For complete dimensions, write for Bulletin S-8.

You can specify POPE PRECISION SPINDLES with Confidence No. 110

Specify **POPE** PRECISION SPINDLES — POPE MACHINERY CORPORATION

CIRCLE INFORM-A-GRAM KEY NO. 144

Size-Positive Boring Heads are the subject of Catalog 6B released by Briney Mfg. Co., P. O. Box 2208, Pontiac, Mich. Details on the styles available, complete with dimensional diagrams, are given in the catalog.

Size control accuracy is provided by an adjusting principle which requires no loosening or tightening.
Circle Inform-A-Gram No. B70.

An Improved Column-Type Air Gaging Instrument is the Dearbornaire. These Dearbornaire air gaging instruments, components, accessories, gaging elements, and setting masters are covered in a comprehensive catalog. The catalog contains ordering information, diagrams, photos, and descriptions of the various items. Dearborn Gage Co., Air Gage Div'n, 22038 Beech St., Dearborn, Mich., or — **Circle No. B71.**

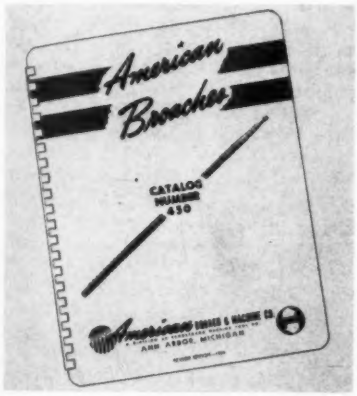
Kendex Tooling with button-type "throw-away" inserts is illustrated in a 12-page folder. The features include solid chip breakers and shims or insert seats. More than 200 tools are listed in 17 holder styles, 11 of which are negative rake and the others, positive rake. Folder B-301 is provided by Kennametal Inc., Latrobe, Pa., or —
Circle Inform-A-Gram No. B72.

Insure True Precision Machining and save on setup time with Clamp-All parallels. The Clamp-All parallel incorporates "built-in" clamps and hold downs, eliminating the need for bolts, straps, clamps, etc. The advantages and applications of the parallels are explained and illustrated in the bulletin, "Clamp-All Parallels," issued by Arcade Mfg. Co., P. O. Box 243, Arcade, N. Y., or — **Circle No. B73.**

A New Expanding-Collet is a one-piece expanding arbor actuated in the same manner as collets that will grip in a hole as small as ⅛". A bulletin gives detailed information on the expanding-collet including design principle, outstanding features, applications, special designs to suit specific needs, and dimensional diagrams. Copies of the Expanding Collet Bulletin are made available by Erickson Tool Co., E. 23rd and Hamilton Ave., Cleveland 14, or — **Circle Inform-A-Gram No. B74.**

Eliminate Separate Solenoid Valves and relief valves and reservoirs with the Oil-Dyne hydraulic power unit. This "miniaturized" compact unit requires no cumbersome unit base and can be mounted anywhere, vertically or horizontally. It features pressures to 3000 lbs. A bulletin contains dimension diagrams and a graph showing capacity pressure curves. Also included are wiring diagrams for Oil-Dyne power packs. In addition, there are diagrams of pressure switches and ½", ¾", 1", and 1¼" bore cylinders. Get your bulletin from Oil-Dyne, Inc., 2115 W. Marquette Rd., Chicago 36, or — **Circle No. B75.**

"American Broaches" is the title of the Revised Catalog 450 now available from American Broach & Machine Co., Ann Arbor, Mich. The catalog is divided into 2 sections — the first covers broaches and the second,



broaching machines and applications. The first part not only pictures and describes the broaches, but also shows typical broached parts and discusses broach design and the resharpening and care of broaches. **Circle Inform-A-Gram No. B76.**

Shave External or Internal Spur and Helical Gears by the conventional shaving process with the Red Ring Model GCI rotary gear shaving machine. Design features, operating principles, and an automatic differential up and down feed mechanism are shown and detailed in a 12-page catalog. Specification tables are also given for a complete line of shaving machines. Copies of Catalog S-56-1 are made available by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, or — **Circle Inform-A-Gram No. B77.**

Prefabricated Spherical Corners can be welded into place on weldments having round edges, such as machine tables, housings, drip pans, etc. They are made in metal thicknesses ranging from ⅛" to ½". A price list, diagrams, and details on the corners are contained in Circular 561 issued by Conner Steel Products, 24690 Telegraph Rd., Detroit 19, or — **Circle No. B78.**

Small Hole Drilling is performed by HI-EFF sensitive precision drilling machines. Ten standard models are available in Series A, B, and C. In addition, there are special models. Specifications and details on each of the series are given in Bulletin 182 from Taylor Dynamometer & Machine Co., 6411 River Parkway, Milwaukee 13, or — **Circle Inform-A-Gram No. B79.**

New ALIGNING BUSHING

for Small Turret Lathes and Single Spindle Automatics

CURRENT STOCK SIZES		
O. D.	I. D.	ECCENTRICITY
1"	¾"	.016"
¾"	½"	.016"
⅝"	½"	.016"

other sizes available on special order

Cures Mis-alignment Simply...but Accurately

That old bugaboo — machine mis-alignment — is a thing of the past. For now you can compensate for this "trouble maker" with the new J & L Aligning Bushing.

There's no guesswork involved — no approximations — no overhang. And it's *simple* to use.

The complete unit, consisting of a pair of eccentric bushings, both graduated in thousandths, can be set and put into use in a matter of minutes.

What's more, the unit sets flush with the face of the turret. It *adds no length* to your tools.

Write Dept. 710 today for free, illustrated instruction sheet.

JONES & LAMSON

Class III Guaranteed Not Sometimes, but Everytime!

JONES & LAMSON MACHINE COMPANY, 519 Clinton St., Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 145

A New Concept in Measurement and Inspection is the Moore universal measuring machine. Model No. 3 has the capacity for measuring larger workpieces to laboratory tolerances. An illustrated bulletin gives its accuracies, specifications, and features. For copies, contact Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn., or —
Circle Inform-A-Gram No. B80.

The "Light-Heavyweight" Machine Tool Line produced by Walker-Turner Div'n, Kearney & Trecker Corp., Plainfield, N. J., is highlighted in a 32-page pocket-size catalog. Each machine and its features are illustrated and described, and the specifications listed. Included are arbor saws, jointers, shapers, surfacers, jig saws, band saws, lathes, etc. Get your copy from the company. **Circle No. B81.**

Electric Indicating Temperature Controllers are featured in Bulletin 1025B from Sarco Co., Inc., Dept. P, Empire State Bldg., New York 1. A simplified operational sketch shows how the LSI controller can be used to provide sequence control combinations such as stepheating, heating and cooling, wide differential control, holding and operating temperatures, and also temperature control plus operation of signal devices.
Circle Inform-A-Gram No. B82.

A Specification Sheet on the Renco-Aire automation package with micro-action air-operated directional valve is available from Renco-Toledo, Inc., 819 N. Reynolds Rd., Toledo 7. The automation package quickly converts hand-powered machine tools to fully or semi-automatic operation. Included on the sheet are photographs, scale drawings, construction data, specifications, and prices. **Circle No. B83.**

End Blocking and Shimming Odd Shaped Pieces for tool room machining with the Ampogrip fixture. The fixture is ideal for short run production jobs and can be applied to all types of machine tools. Details, specifications, and application photos are found in the bulletin, "Mechanical Octopus with Tentacles of Steel," supplied by American Positive Grip Vise Corp., Olivine St., Willimansett Mass., or — **Circle No. B84.**

Speed Difficult Small Hole Drilling Operations down to 0.001" with a Micro-Drill. A calibrated micrometer depth control provides positive stop. Tolerances of 0.0005" can be maintained on blind holes. The Micro-Drill is available as a multiple hole unit with 2-way table travel and as a single hole unit with stationary table. For more information, get Form 9 from The Dumore Co., Racine, Wis., or —
Circle Inform-A-Gram No. B85.

The Swinglock Clamp operates with one hand and in any position without the strap falling out of position, even in the unclamped position. The Wespo clamp is furnished with hand knobs or bar knobs and is available in all of the regular stud sizes ¼" through ¾" and in a smaller size with a 5/16" stud. For further details get a bulletin from West Point Mfg. Co., 26935 W. Seven Mile Rd., Detroit 19, or —
Circle Inform-A-Gram No. B86.

For Angle Tangent to Radius Wheel Dressing use the new direct reading Tangi-Matic Dresser. With this instrument, no special attachments are needed. Setup for grinding wheel dressing can be accomplished in less than one-fourth the time required by other methods of setting radius. Read all about the Tangi-Matic Dresser in a bulletin from Perfex Gage & Tool Co., 123 Avery St., Mt. Clemens, Mich., or —
Circle Inform-A-Gram No. B87.

Here's NEW VERSATILITY

● **MEASURES ON** ID's as small as ¼", OD's as small as ⅛", flats, tapers, narrow splines — in microinches (arithmetical or r.m.s. average). Measures ALL surfaces in many plants.

● **DEPENDABLY ACCURATE.** Meets or exceeds all ASA requirements. Simple to use, and tamperproof; no calibration by the operator. Built for continuous shop use.

● **COMPLETE as shown — $1295.00.**

Write Today for FREE BULLETIN LT17.

THE PROFILOMETER — First in roughness measurement, since 1936.

Profilometer is a registered trade-mark.

MMC MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 146

GROWING PAINS

General Electric Company has announced a $6,800,000 expansion of its Gas Turbine Department facilities in Schenectady. The department manufactures gas turbines for electric utility, industrial, railroad, and marine use. The company is also undertaking a $1,200,000 expansion and modernization program for its small Turbine and Supercharger Department in Fitchburg, Mass. Plans call for the erection of a new high pressure boiler plant which will produce steam for the testing of the department's products. Two nine-ft deep test pits are included in the construction program. A 10-ft vertical boring mill and other smaller machine tools will be added to the production line.

◆

The Carborundum Company will increase its capacity for the production of zirconium, a metal used in atomic reactors, to over 1½-million pounds per year with the construction of a new plant in Parkersburg, W. Va. The multi-million dollar facility will be operated by **Carborundum Metals Company, Inc.**, a Carborundum subsidiary. Carborundum Metals is also expanding its plant and adding new facilities at Akron, N. Y.

◆

Square D Company is planning to build four new units, to be completed by the end of 1957. Included will be a major facility in Milwaukee to mass produce electrical control components, and a smaller regional assembly plant in Denver. During the past year, the company opened plants at Cedar Rapids, Ia.; Secaucus, N. J.; and Royal Oak, Mich.

◆

The Aerophysics Development Corporation has broken ground on a 104-acre site in Santa Barbara, Calif., for a $1,300,000 facilities expansion program. The engineering building and research center is expected to be completed by September of this year. The company is a wholly-owned subsidiary of **Studebaker-Packard Corporation.**

◆

General Controls Company has completed a new building that increases its San Francisco facilities by 120 percent. This showroom and warehouse covers 4400 sq ft.

The Federal Machine and Welder Company will spend approximately $750,000 during the next year to increase its production facilities. Most of the money will be used for new machinery.

◆

General Motors Corporation is building its first new plant since 1953 in the San Francisco-Oakland Bay area. The plant will assemble Buicks, Oldsmobiles, and Pontiacs. The factory is expected to be in operation in time to build the 1958 model cars.

A new office and warehouse building has been occupied by the Los Angeles branch of **Gardner-Denver Company.** The building consists of an office area, a machinery warehouse, and an enlarged parts department.

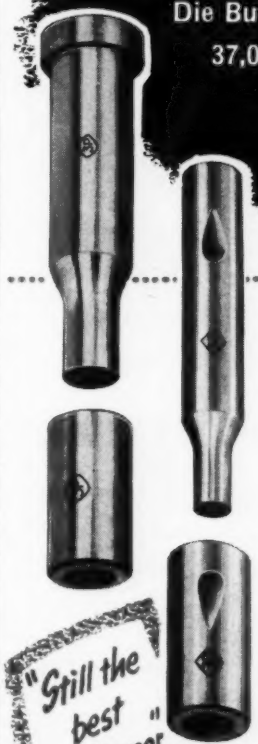
◆

The H. O. Canfield Company has built a plant in Seymour, Ind., for its subsidiary, **Wabash Rubber and Plastics Corporation.** Production of plastic items for the appliance and automotive industry will start there this month.

When it's SERVICE you want ...call PORTER!

3P

IMMEDIATE DELIVERY of 3-P Punches and Die Buttons is made possible because over 37,000 Standard sizes are in STOCK. In fact, Porter Precision Products are stocked in all principal cities.



Paired for Production

The 3-P catalog can save you thousands of dollars. It contains a perfect pair — to answer every piercing need. PORTER head PUNCHES and DIE BUTTONS are made from three types of finest tool steel, and are offered in any DECIMAL size.

Completing Porter's Production team are the new 3-P BAL-LOK* Punches and Die Buttons. These, too, are available for immediate delivery, any DECIMAL size. "Down time" is cut to a minimum — and you pay nothing extra for the extra quality — or for DECIMAL sizes. Better yet, all PORTER PUNCHES and DIE BUTTONS are completely interchangeable! So save time — save money. Write for full details today, and get the PUNCH you need — WHEN you need it!

"Still the best performer"

* Reg.

PORTER PRECISION PRODUCTS

PRinceton 1-6338 · P.O. Box 208 · Cincinnati 15, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 147

LAYOUT FLUID
FOR ANY METAL

Send for FREE SAMPLE

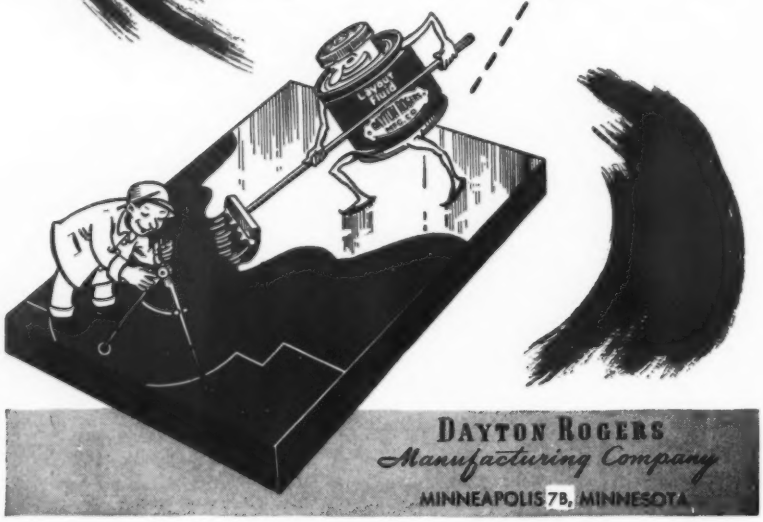
Your local supply house carries Dayton Rogers', Layout Fluid.

Applicable to all metal. One merely wipes the surface clean and then brushes on the Layout Fluid.

Dries Instantly. No waste. Scribed lines are pronounced and contrast to the dark blue background, thus relieving eyestrain.

Assures greater accuracy and speeds up work. You will save time and money on all layout jobs.

A sample is waiting for you. Send for it today.



DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1481

STEP RIGHT UP FOLKS FOR A FREE HELPING OF STINGING CHIPS ···
GET 'EM WHILE THEY'RE GOOD 'N' HOT!!
ENOUGH OF THAT! THE BOSS WANTS YOU TO USE THIS DILLEY MAGNETIC GRIP SHIELD!!
HERE! SLAP IT ONTO YOUR MACHINE AND YOU'LL SAVE EVERYBODY FROM CUTS AND BURNS!
NEXT DAY···
JOE'S PRODUCTION HAS DOUBLED AN' EVERYBODY'S SAFE AN' HAPPY!!
FINE! I WANT DILLEYS ON EVERY MACHINE IN THE PLACE!

Why don't *You* get HAPPY?

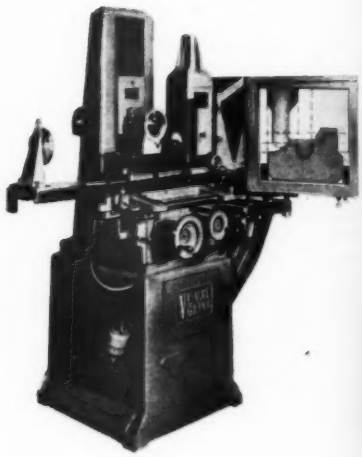
Write us today for descriptive folder with prices.

The Dilley Mfg. Co., 1633 Ansel Rd., Cleveland 6, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1482

if your production calls for PRECISION

you need this VISUAL-GRIND



It provides an entirely new concept accurate, surface form - grinding on tool steels or tungsten Carbide. The operator simply works to the templet • • • • on the screen which acts as a constant comparator providing continuous inspection.

We invite your technicians to visit our plant for operational demonstrations. . . . Or write for new technical literature.

THE CLEVELAND GRINDING MACHINE CO.

1643 EDDY ROAD • CLEVELAND 12, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1483

Exceptional Elastomeric Adhesive

A recently developed elastomeric type adhesive is now available from the Minnesota Mining & Mfg. Co., 411 Piquette Ave., Detroit 2. The adhesive is labeled EC-1357 and is used for contact bonding or hot bonding of porous or non-porous surfaces. This bonding material has a rapid strength buildup rate, a high softening point, and an excellent resistance to plastic flow.

Since EC-1357 has an unusual adherence to metal it can be used to great advantage for combining other more porous material with metal (as well as metal to metal). For example a useful panel can be made by bonding aluminum sheets to an impregnated Kraft honeycomb paper. When used as shown in the illustration, EC-1357 offers double peel strength that could not be had with resin-type adhesives.

In production hot bonding, parts are chemically cleaned before the adhesive is applied with a hand roller, or sprayed on with conventional equipment. The adhesive is dried with infra-red heat and the parts, then, hand assembled and passed

through pressure rolls. In the case of low production, air drying can be used and hand rolling applied for pressure.

This adhesive can be used effectively in contact bonding decorative plastic laminates to metal counter and table tops. In this instance the adhesive is applied and allowed to dry for at least 15 min and no longer than 45 min. Pressure can be applied with a suitable hand roll. In contact bonding, if the surfaces are of a porous nature, such as wood, two coats of adhesive are usually applied. If the surfaces are impervious, the adhesive should be applied well in advance of the assembly operation.

Toluol Hexone or commercial lacquer thinner can be used to clean any excess adhesive from the bonded parts.

The EC-1357 adhesive is grey-green in color, has a thin syrup consistency and weighs about 7 lb/gal. It is heat resisting up to 160° F.

Vertical Boring Machine Offers Unique Advantages

The Vertical Bore-Matic's new features help increase production and mean easy operation and maintenance. The machine is being produced by The Heald Machine Co., Worcester 6, Mass.

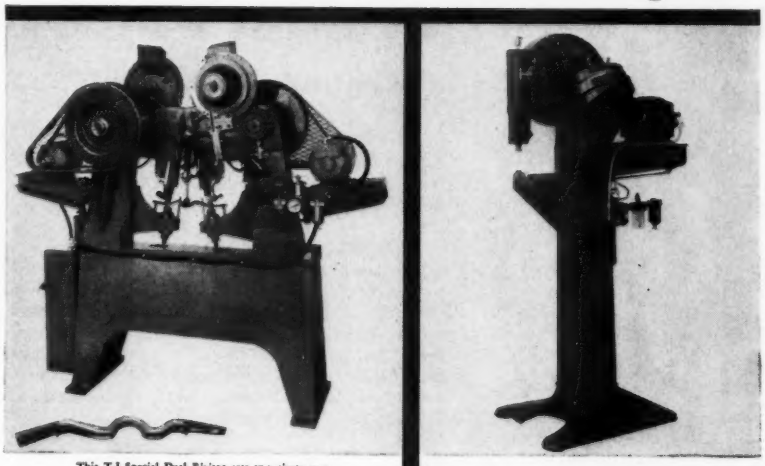
The capacity of the standard Vertical Slide Unit Bore-Matic ranges to parts having a diameter of 16". The machine is adaptable to a wide range of parts, being particularly well suited to the machining of flywheels, impellers, bell housings, clutch plates, and similar parts.

Vertical hydraulic operating slide units mounted on the base column can be arranged to carry a variety of

. . . *Continued on Page 153*

T-J *does your riveting and clinching*

Faster...Automatically!



This T-J Special Dual Rivitor sets two rivets at a time . . . consists of two 8" throat Model R Rivitors, each with 10" hopper, special oversize anvil post, and special horn. Sample of work shown below machine.

RIVITORS

T-J Clinchors adaptable to a wide range of clinch nut setting problems. Gravity feed model shown here.

CLINCHORS

Automatic feeding and setting with T-J Rivitors and Clinchors help you reduce labor and step up SPEED in a wide range of assembly jobs for aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞" long. Air-powered sets aluminum alloy rivets or steel rivets up to ¾" long. Throat depths 8" to 36".

Write for Clinchor bulletin 555; Rivitor bulletins 646 and 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

39 Years Experience

CIRCLE INFORM-A-GRAM KEY NO. 149

MEN YOU SHOULD KNOW

Bart A. Rossfeld has been appointed vice president of the National Bearing Division, American Brake Shoe Co. **Albert L. Hunt** has taken over as general manager of the division's St. Louis plant.

◆

The recently elected president of Whitney Chain Co. is **Lewis H. Whitney. Einar A. Hanson** is the new vice chairman of the board and **Brenniss G. Tyrrell,** executive vice president and treasurer.

Grant S. Wilcox has been named plant manager of Ross Operating Valve Co.'s plant on Golden Gate in Detroit. He has a broad background as a tool engineer and factory administrator.

◆

The election of **Edgar Washburn** as executive vice president has been disclosed by American Engineering Co. At the same time, **W. C. Miles** became vice president and general manager.

Specify
GRAYMILLS
Superflo
Coolant Pumps
Rugged • Dependable
Abrasive-Proof
Years from the date of installation, the smooth, quiet performance of Graymills Superflo Pumps prove their rugged dependability.
You install 'em and forget 'em. The abundant flow continues even after years of pumping abrasive-charged liquids. Top rated motors—simplified mounting and electrical connections—complete interchangeability with similar pumps of other makes. Specify Graymills Superflo Pumps for original equipment and replacement. Sold by Industrial Distributors everywhere.
Send for new catalog—with interchangeability tables
GRAYMILLS CORPORATION
3713 N. LINCOLN AVE., CHICAGO 13, ILLINOIS
WEST COAST: 3721 MELROSE AVE. • LOS ANGELES 29
139
H-7000 series
1/4 HP 16 GPM
15' Head
Series Thirty
1/4 HP 20 GPM
15' Head
Series Forty
1/2 HP 36 GPM
15' Head
Series Fifty
1/2 HP 65 GPM
15' Head
36 STANDARD MODELS ALL AVAILABLE TO JIC STANDARDS
CIRCLE INFORM-A-GRAM KEY NO. 150

The new works manager of the A. O. Smith Corp. frame manufacturing plant at Granite City, Ill., is **Thomas A. Sullivan.** He succeeds **Peter S. Blake** who has returned to Milwaukee where he is attached to the staff of **Fred Mackey,** vice president in charge of manufacturing.

◆

Milton E. Trueman has been named plant manager of the Mound Road engine plant in the newly-organized Engine Division of Chrysler Corp. He has had more than 30 years of manufacturing experience with Chrysler Corp. and Dodge Brothers. Other appointments include **J. F. Anderson** as manager of production engineering; **Donald R. Kinker,** divisional chief engineer; **Harry R. Bentley,** manager of production planning; and **John P. Horgan,** manager of administration and organization. **G. W. Trichel** is the new president of the Amplex Division. In this post he succeeds **A. J. Langhammer.** Mr. Trichel joined Chrysler in 1946.

◆

The new general production manager of all plants of the Timken Roller Bearing Co. is **James Freese.** Mr. Freese who started with the company in 1929, succeeds **James Reid** who has retired. **Charles L. Richey** is serving as assistant general production manager.

◆

Joel Hunter is assuming the responsibilities of the general management of Crucible Steel Co. of America. He succeeds **William P. Snyder, Jr.** who is retiring. Mr. Hunter who has been president of the company since 1954, is now the chief executive officer.

◆

The new chief engineer of Cleveland Metal Specialties Co. is **Al Gross.** He is in charge of the design and development of new products and of technical services to customers. Mr. Gross who formerly was vice president of Royalcall, Inc., is the designer of the "walkie-talkie". He is long an exponent of printed wiring and has had published papers on miniaturization of circuits and printed circuit techniques.

◆

William E. Bour has been named to fill the newly created position of manager of the Threading Tools Division of The National Acme Co. He will be responsible for the coordination of all departments in this division. Mr. Bour joined the firm in 1945.

MEN YOU SHOULD KNOW

Robert G. Keller has been appointed chief engineer for the Machine Division of The Lewis Welding & Engineering Corp. The announcement was made by **E. W. Hollis,** general manager of the division. Mr. Keller is in charge of an integrated engineering department which is responsible for design and development work on Lewis proprietary machines, special machinery, and automation equipment. He will be assisted by **Johan Muller,** chief development engineer for the division.

◆

Paul Pick has taken over as chief engineer of The Allen Mfg. Co., according to an anouncement by **James G. Osmond,** president. He succeeds the late **Clarence S. Gates.** As a result of the reorganization of the engineering department, **Edward S. Loika** is chief of production engineering, and **Edward A. Pendleton** is coordinating all engineering projects.

◆

Appointment of **James E. Trask** as head of the central machine design department of the Engineering Division has been announced by Minnesota Mining & Mfg. Co. In this position he is responsible for providing machine design services for divisional engineering groups, including the New Products Division and the staff laboratories. Mr. Trask joined the company in 1929 as a draftsman.

◆

Clyde T. Mooney has joined Engineering Service, Inc. of America as president and general manager. **Joseph J. Grum** and **K. C. Martens** who acquired ownership of the firm in September, 1955, became vice president and secretary-treasurer, respectively.

◆

The new position of executive vice president of A. B. Dick Co. is filled by **Karl R. Van Tassel.** His job is to guide the activities of the vice presidents heading the company's five major divisions. Mr. Van Tassel comes to the company from General Electric Co. where he was general manager of the Knolls Atomic Power Laboratory.

◆

Charles L. Holbert has become executive vice president of H. K. Porter Co., Inc., according to an announcement by **T. M. Evans,** company president. Mr. Holbert who will be operating head of Porter, succeeds **Clarence R. Dobson** who has retired. Before joining the company, Mr. Holbert was with Southern Pacific Milling Co.

Clark Hague now heads the Hague Regulator Corp. He was with Askania Regulator Co. for more than 25 years.

◆

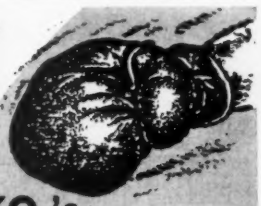
The Wellman Bronze & Aluminum Co. has announced the addition to its staff of **Clayton A. O'Neill** as manager of the Permanent Mold Division. He formerly was superintendent of the Light Metals Division, Thompson Products, Inc.

In a recent election, **Robert S. Ingersoll** became president of Borg-Warner Corp. **Lester G. Porter** was elected to the position of executive vice president and **Roy C. Ingersoll** was re-elected as board chairman and was named chief executive officer.

◆

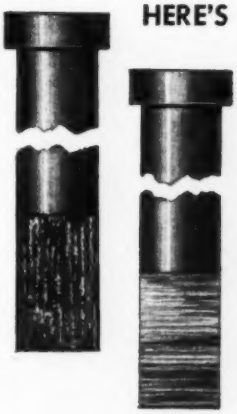
Howard E. Moore has taken over as foreman of operations in the engineering department of Pontiac Motor Division, General Motors Corp.

DURABLE



The 1-2 PUNCH that KO.'s
PRESS DOWN-TIME
PRODUCTION DELAYS

HERE'S THE SECRET OF DURABLE'S SUCCESS:



1. VERTICAL LAPPING
. . . gives a "grinding grain" parallel to plane of action—reduces friction, heat, firing and galling.

2. ELECTROCOATING
. . . chrome carbide has 25% less friction than plain steel—further reduces friction, heat, firing and galling.

The DURABLE combination of VERTICAL LAPPING plus ELECTROCOATING knocks out your production delays with fewer shut-downs, less die maintenance, longer uninterrupted production. Vertical Lapping and chrome electrocoating make the Durable Patent Piercing Punch the perfect answer to YOUR PERFORATING PROBLEMS.

CUTS DOWN-TIME—
RETARDS FIRING AND GALLING—
GIVES MUCH LONGER PUNCH LIFE

Write today for full details on YOUR punching problems. You'll receive a fast, practical reply from the most DEPENDABLE punch maker in the world!

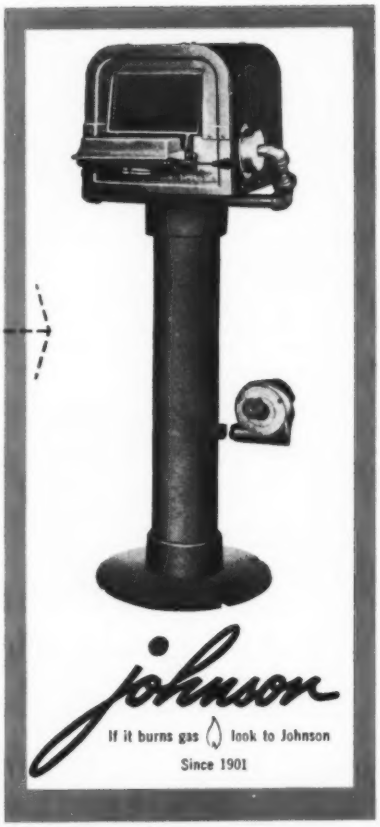
IF IT'S DURABLE IT'S DEPENDABLE

DURABLE NIB PUNCH gives improved punching on harder alloys.

DURABLE INTERMESH SLEEVES supports Punch so as to perforate metal many times thicker than hole diameter

Patented and made exclusively by
DURABLE PUNCH & DIE COMPANY
1214 W. Madison Street, Chicago 7, Illinois
CIRCLE INFORM-A-GRAM KEY NO. 151

1500° IN 5 MINUTES
2300° IN 30 MINUTES



johnson

NUMBER 120 HI-SPEED FURNACE

That's the kind of quick heating action you get with this compact, powerful furnace. It's economical to operate, too. Fast heat-up saves time and gas. High-temperature insulated firebox, 5" by 7¾" by 13½", gives even hardening of high speed and carbon steel dies, tools and small parts. Temperature easily regulated. G.E. motor and Johnson Blower included. 120,000 BTUs per hour.

Pedestal style, F.O.B. Factory....$167.00
No. 120 also available in bench style.

Write today for free Johnson Catalog
Johnson Gas Appliance Company
575 E Avenue NW, Cedar Rapids, Iowa

johnson
If it burns gas look to Johnson
Since 1901

CIRCLE INFORM-A-GRAM KEY NO. 1521

Miccro Spray

LAY-OUT DYE
(Purple)

MICCRO Lay-Out Dye, long the leader in its field, now available in an AEROSOL package for SPRAYING.

All the advantages—instant drying; clear, sharp lines—*plus* easy-to-use, dependable, efficient MICCRO Spray container.

•

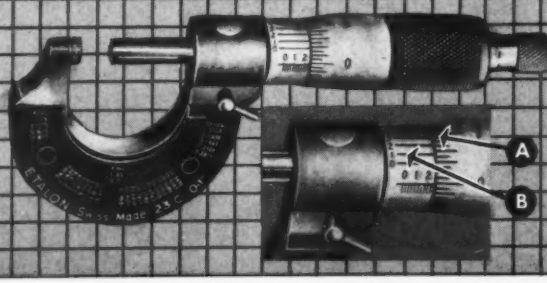
Regular MICCRO Supreme Lay-Out and Identification Dye in seven distinctive colors available as always in brush-in-cap and conventional containers.

Write for circular on company letterhead

MICHIGAN CHROME & CHEMICAL COMPANY
8615 Grinnell Ave., Detroit 13, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1523

ONE PIECE STAINLESS STEEL SPINDLE AND SCREW
Hardened and ground from the solid . . .



ETALON 23C MICROMETER

A—Half-thousandth graduations on thimble allow tenths readings with only 5 Vernier graduations.

B—Deep machine divided graduations on both thimble and barrel assure easy reading.

• Reads to .0001" • Forged frame • Heavy duty tungsten carbide measuring faces, optically lapped • Quick acting positive lock • Feather touch friction stop assures senstive feel • Dull chrome finish on thimble and barrel eliminates glare • Built for accuracy under the most rugged applications • In handsome contour case.

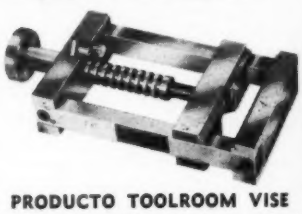
ALINA

WRITE FOR CATALOG on complete line of precision measure instruments:
VERNIER CALIPERS • MICROMETERS • DIAL INDICATORS

ALINA CORPORATION
401 Broadway, New York 13, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1522

ESSENTIAL



PRODUCTO TOOLROOM VISE

Producto's Precision Toolroom Vise is essential equipment for your jig borers, surface grinders, drill presses, tappers. It's extremely strong, yet weighs only 13 lbs. and has a 2" high frame. Has large jaw opening, will clamp heavy as well as light workpieces. All surfaces hardened and ground. Works on five surfaces. Write for Bulletin TE2-103.

THE PRODUCTO MACHINE CO.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1524

. . . Boring Machine, from page 149

tooling or auxiliary tool slides. In the setup shown in the picture, multiple tool blocks are mounted on horizontally positioned hydraulic slide units. These in turn are positioned on vertical slide units, which are also hydraulically powered. This bi-way slide arrangement is for boring, chamfering, and facing automatic transmission parts; the vertical slide movement accomplishes the boring and chamfering and the horizontal slide movement generates the face.

The use of angularly mounted auxiliary hydraulic slides allows tooling to approach work over a wide range of angles.

The workpieces are loaded on the rotating workholding fixtures which are mounted on vertically positioned Heald precision boringheads. The boringheads are driven individually by motors mounted at the rear of the base.

Continuous production can be maintained by loading one station while the other station is in operation; this is possible as each station is operated independently. The pushbuttons for this independent operation are grouped at the front of the machine and feature double cycle start and stop buttons. This is an additional safety precaution making it necessary for the operator to use both hands, which is especially desirous on the starting cycle.

Chip disposal is facilitated by sloping chutes which permit the chips to fall below the work where they may be removed manually or by conveyor.

The base is a stress-relieved, steel fabricated weldment with substantially increased stiffness and strength over a similarly designed cast base.

Protect Your Future

Buy

U. S. Savings Bonds

New Brazing Alloy Produces Joints of High Strength

A new high silver content alloy blended with special flux in convenient "paint-on" paste form has been developed and is recommended for preplacement, tinning, filling, overlaying, and joining.

This silver alloy, Eutec-SilWeld 1618, made by Eutectic Welding Alloys Corporation, 40-40 172nd Street, Flushing 58, New York, is applied with brush or spatula and flows readily by capillary action leaving no joint-weakening bare "islands" even on long lap joints and complicated shapes.

It is particularly recommended for chemical, food and dairy applications, and has many advantages for instrument manufacture, fabrication, tool repairs, carbide tipping and aviation parts. It is used on all metals except aluminum, magnesium, and white metals and is ideal for torch, furnace, induction or resistance heating, producing shear strengths up to 125,000 psi.

HOW TO FIGURE PRESS FEEDING

Economy!

UNIT COST DOWN, PROFITS UP! WITH DICKERMAN AUTOMATIC PUNCH PRESS FEEDS . . . AND HERE'S THE REASON WHY . . .

Hand Feeding . . .

8 hrs. @ 2000 pieces/hr. 16,000

Labor @ $1.60 hr. $12.80
Cost per M pieces — 80¢

with Dickerman Feeds (83% press efficiency)

8 hrs. @ 100 RPM x 60 48,000

Labor @ $1.60 hr. $12.80
Cost per M pieces — 22½¢

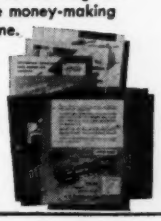
Dickerman Press Feeds don't get tired. Dickerman Press Feeds produce — and keep on producing — 24 hours a day if necessary without let-down, human error. Downtime is negligible—even on million plus runs.

Dickerman Press Feeds mean real savings, real gains. Dickerman Feeds cost little to install — pay for themselves in days — pay profits year after year AND as Dickerman Feeds will operate at any speed the tooling will withstand, unit cost drops as production increases. For automation . . . For new economy . . . install dependable Dickerman Feeds on all your press equipment now!

TOOL AND DIE DESIGNERS . . . .

Full scale templates on all Dickerman Hitch Feeds®, Die Feeds and Rol-Di-Feeds available upon request.

SEND today for catalogs on the complete money-making Dickerman line.



Dickerman

H. E. DICKERMAN MFG. CO.

324-212 Albany Street • Springfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 153

Cut Die-Making Cost

by reducing set-up time as much as 90%

With Jig Boring Accuracy

*Proved by actual on-the-job performance

ADVANCE CROSS-SLIDE ROTARY TABLE

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work. Write for specifications and literature today.

MORRISON ENGINEERING COMPANY

937 West Lake Street, Dept. A, Chicago 7, Illinois

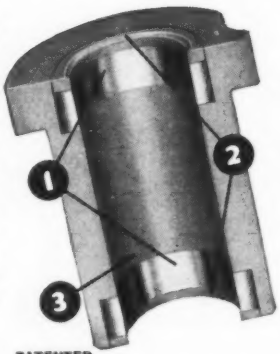
CIRCLE INFORM-A-GRAM KEY NO. 1541

MEYCO CARBIDE INSERTED DRILL JIG BUSHINGS PROVE THEMSELVES IN Automation!

The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures . . . accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

Write for information and price list, ask for Catalog No. 41.



PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

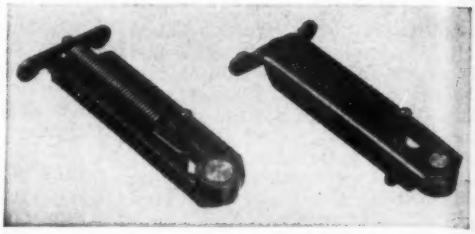
EST. 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1542

FOR POSITIVE STOCK ALIGNMENT

IN PROGRESSIVE DIES



Amcor Roller Stock Pushers

SPEED UP PRODUCTION with precision-made AMCOR Roller Stock Pushers. Easy, smooth stock feeding, without buckling, assures more production with less operator fatigue.

SAVE MONEY. AMCOR Roller Stock Pushers sell for just a fraction of what hand-made bench models cost to make.

SIMPLE TO INSTALL. Requires only a slot milled in the stripper plate, and a hole drilled in the die block and stripper plate. Tracing template for slot and hole location is supplied. When die is sharpened, no refitting is necessary.

The AMCOR Roller Stock Pusher is quickly adaptable to any work specifications. Distributors throughout the country stock a complete line of nine models to fit all production needs.

Write us for complete information

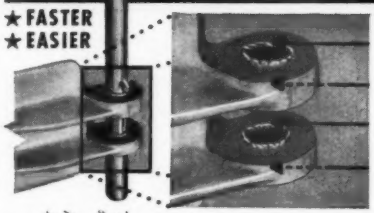
APPLIED MECHANICS CORPORATION

460 LYON, N. E. GRAND RAPIDS MICHIGAN

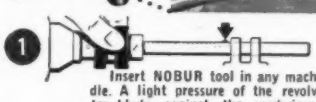
CIRCLE INFORM-A-GRAM KEY NO. 1543

HOW TO.... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION with the amazing NOBUR TOOL

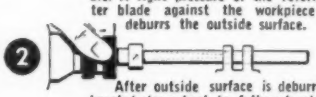
★ FASTER
★ EASIER



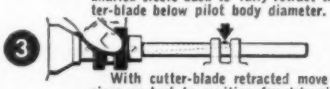
No more hand finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by **machine operation.** Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.



1. Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.



2. After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.



3. With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

Write for FREE Folder

Send for all details on Nobur Tool Products TODAY!

NO BUR TOOLS

NOBUR MANUFACTURING CO.

6860 Farmdale Ave., No. Hollywood, California

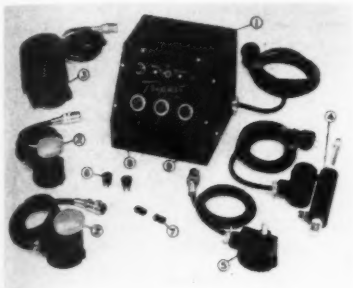
CIRCLE INFORM-A-GRAM KEY NO. 1544

New Press Control Increases Safety and Production

A new combination master control, known as Trippit, is applicable to all power presses, shears, and brakes. The control is straight electrically operated.

Trippit offers a number of production increasing features such as automatic tripping by workpiece; automatic gaging; eliminates rejects; counts; and shuts off machine after pre-set count.

Its safety features are: two hand safety by means of hand trips; single stroke or repeat selection for presses; four hand safety for two operators; no operator fatigue; die protection; parts must nest perfectly or press will not trip; protects all operations in automatic setups such as, press stops at end of coil, and press stops if material jams.



Parts of the control are identified by number in the illustration: (1) Trippit control box, (2) safety hand trips, (3) electric foot trip, (4) clutch actuator, (5) limit switch, (6) keys, (7) die switches, (8) socket for 12-volt counter, and (9) socket for 110-volt counter.

Trippit has been developed by General Automation Corp., 65 South Broadway, Yonkers, New York

Hollow Aluminum Bar Stock Points to Large Savings

Full-scale production of hollow aluminum bar stock, a new mill product developed by Harvey Aluminum, has been announced by the California aluminum company. The special hollow machining material offers machine tool operators all of aluminum's favorable machining characteristics at a substantial savings over conventional solid bar stock.

Availability of the hollow stock climaxes an extended development program conducted by Harvey in its automatic screw machine facility, which is the largest in the West.

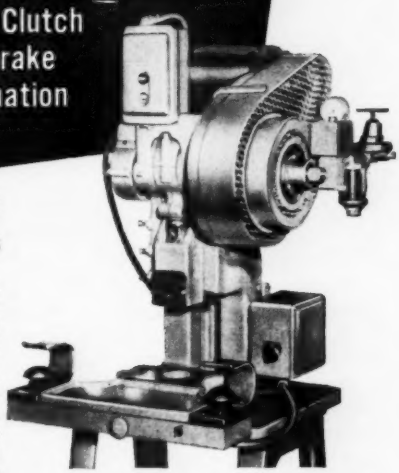
The aluminum alloy utilized for the new hollow machining stock is 6066, a wrought alloy developed by Harvey Aluminum, a division of Harvey Machine Co., Inc. General characteristics of 6066 are excellent machinability, superior corrosion resistance, high strength, and excellent finish.

For most machining applications, weight of the hollow stock averages less than half of that of a comparable size in solid aluminum bar, resulting in lower handling costs.

Because no time is required to rough out a cavity, the new stock increases the speed of machining operations. Closer tolerances can be held because the normal heat and pressures generated in machining solid bar stock do not occur in working hollow material.

Tests performed over long production runs demonstrate that the new stock has superior machining qualities for inside working tools inasmuch as the hollow machining stock has the same cold worked properties on both the inside and outside surfaces.

Announcing... the new JUNIOR PRESS with Air Clutch and Brake Combination



SAFETY TRIPPING DEVICE
2 hands must hit controls

This Perkins Junior "SK4" frame press is equipped with a combination air clutch and brake. The press capacity is about five tons. It can be operated at speeds ranging from a standard 325 to as high as 600 rpm. and single trip in one revolution. It is equipped with controls for single tripping with dual push buttons requiring the use of two hands, also for continuous running with top stop and jog. The top stopping position can be varied by an adjustment so that the correct stopping position can be obtained for whatever speed the press is set to run. There are many advantages to the use of air clutches. There are no steel dogs to replace and the maintenance is eliminated. The shaft is coupled to the wheel when the press is turning over so there is no motion between the ram and the wheel. The result is longer life for dies and punches. Higher speeds are possible with no harm to the clutch.

FEATURES: Rugged reinforced frame to prevent deflection.
Dual Push Button Control — safety for the operator.
High Speeds — with no damage to clutch parts. Adjustable top stop position.

PERKINS
MACHINE CO. WARREN, MASS.
PRESS BUILDERS FOR OVER 50 YEARS

CIRCLE INFORM-A-GRAM KEY NO. 155

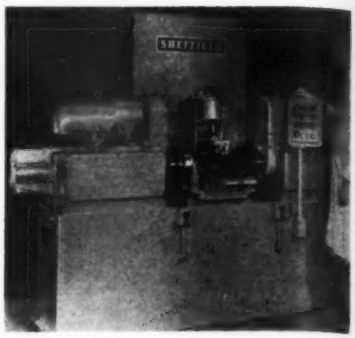
DOUBLE-END BORING PERFORMED ON NEW MACHINE

A new double-end machine that bores, chamfers, faces, and threads both ends of a gate valve body within 2" to 6" pipe size at the rate of 60 parts/hr including loading and unloading is now in production.

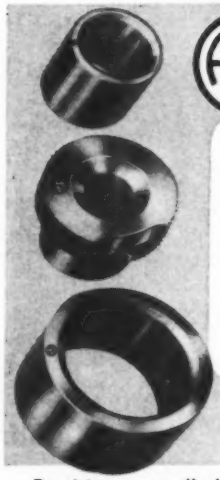
The machine, developed by The Sheffield Corporation, Dayton 1, Ohio, consists of two model 300 Precision-Pak threading and boring units, an air operated work positioner, and a clamping device mounted on a common base. Model 300 Precision-Pak is an individually powered automatic threading unit having a precision lead screw and hydraulic feed for boring and facing. It is powered by a 5-hp motor and has a gear type, 4-speed transmission drive.

The valve body is handloaded into the holding device and the part automatically clamped by an air cylinder. Clamping action initiates the two-cycle machining operation.

First, two Sheffield-Murchey full receding pipe taps equipped with carbide taper reamers, facing and chamfering tools advance into the part automatically, removing approxi-



mately ⅛" stock on boring, 1/16" on facing, and machining a ⅛ x 45° chamfer. A slow-down valve in the hydraulic feed moves the tools in very slowly during facing. After full depth of stroke is reached, the tools automatically retract. Next, the chasers are automatically "cocked" or expanded to cutting position and the taps advance into the part on a precision lead screw which assures perfect thread lead and precise alignment of one end with the other. Upon reaching full thread depth, the chasers collapse, the taps are quickly returned, and the part automatically unclamped and the cycle stopped.



ABC

DRILL JIG BUSHINGS

A•S•A STANDARDS—From Local and Factory Stocks

...of chromium or chromium tungsten oil hardening steels having greater wear resistance than that of regular carbon water hardening steels.

Heat treated in neutral atmosphere, electronically controlled under automatic timing.

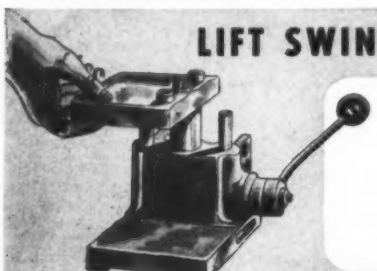
Accuracy • Concentricity • 20% Longer Service

PRECISION PIERCING PUNCHES

Precision controlled heat treatment and grinding. Made from high alloy steel. Initial high qualities are not reduced by grinding and resharpening.

Head, headless, also "ball lock" types, available in standard sizes from stock. Quick delivery on special sizes.

LIFT SWING DRILLING FIXTURE



"Swing away" top plate for faster and easier loading.

Back of fixture machined square to base for 90° operations.

Available in full range of standard sizes and with top plates in several styles.

Quick shipment from stocks located in principal industrial centers
Write us for catalogs of all three

ACCURATE BUSHING COMPANY

Garwood, New Jersey • SUnset 9-1121

CIRCLE INFORM-A-GRAM KEY NO. 156

BATTELLE INSTITUTE UNDERTAKES SYSTEMS ENGINEERING

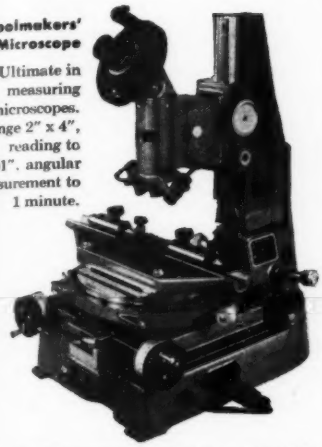
Research in the development and design of automatic processing and control systems is the aim of the new Systems Engineering Division of Battelle Institute in Columbus, Ohio.

In announcing its establishment, Dr. Clyde Williams, Battelle president and director, pointed out that industry and government are looking more and more to electronic and mechanical computers and to computer-like machines to make operations more automatic. The Institute's digital and analogue computers will become working tools of the new division.

The new division, headed by Joseph J. Stone, will analyze, synthesize, and engineer systems to accomplish office and factory automation and the automatic handling of military data. It will also undertake research in the fields of information theory, human engineering, machine computation, and systems stimulation.

Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001". angular measurement to 1 minute.



Precise measurement to 0.0001"

Slash rejects, save money with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.

Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Scale Micrometer or Shop Microscope

High quality, low cost instrument with range up to 0.100". Reading to 0.001", easy interpolation to 0.0002".

Write for Bulletin 161-54 showing applications, models, specifications.

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1571

Wardwell "50 F" Automatic Universal Flute Grinder Sharpens

at very lowest cost

It sharpens and keeps in top condition Taps, Saws, Reamers, Woodruff Key Cutters, Milling Cutters. Saves and makes money for you every day. Grinds straight flutes, spiral points, and sharpens saws in gang.

Takes saws from ½" to 8" diameter, in gangs up to 3¾" long — automatically indexes. Takes reamers down to 1/16" diameter.

No special skill needed. Wardwell 50 F starts making money for you the very first day.

Please write for descriptive literature.

WARDWELL MANUFACTURING CO.
3809 Ridge Rd., CLEVELAND 9, O.

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1572

For your complete power CHUCKING REQUIREMENTS—specify Logan

Air and Hydraulic Operated Chucks

Rotating Air Cylinders

Air Valve

R.P.L. Unit

Electric-operated Air Valves

Logan gives you 1 MANUFACTURER RESPONSIBILITY

Logan gives you 1 ORDER PURCHASING

Logan gives you 1 SOURCE MANUFACTURING

Write for FREE copy of "Circuit Rider" booklet. It explains the above circuit plus many others.

SAVES TIME Logan AIR AND HYDRAULIC EQUIPMENT EXPORT-WORTHY

YOUR DEPENDABLE SINGLE SOURCE FOR ALL AIR AND HYDRAULIC EQUIPMENT

MEMBER Natl. Mach. Tool Builders' Assn., Natl. Fluid Power Assn.

Logan

PROPERLY DESIGNED — PROPERLY EQUIPPED

LOGANSPORT MACHINE CO., INC.
844 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL-TYPE AIR CYLS.
- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 100-5-1 ULTRAMATION CYLINDERS
- ☐ 51 PRESSES
- ☐ FACTS OF LIFE
- ☐ 62 SURE-FLOW PUMPS
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 HYD. VALVES
- ☐ 200-5 FITTINGS
- ☐ 70-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

TO:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CIRCLE INFORM-A-GRAM KEY NO. 1573

Systematic "NTS" salvage is the best way to cut cutting tool costs

Stop before you discard a worn or damaged cutter. It may be worth many times its scrap value!

Since 1912 we have been restoring all kinds of cutting tools to new usefulness to help shops control their cutter costs.

Can we assist you in studying your operations and tool usage to determine if a salvage program will save money in your plant? There is no obligation.

Write for this catalog and the salvage story.

NATIONAL TOOL SALVAGE CO.

6511 EPWORTH BOULEVARD DETROIT 10 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1581

. . . Gaging from page 79

is then fastened firmly to the bar by tightening the single screw (J), to maintain this setting.

The complete gage is next removed from the workpiece in order to take an accurate micrometer measurement over the outside of the pegs (K) to obtain the diameter (M). This dimension will be smaller than the major diameter desired, by twice the distance (X). This later value can, however, be readily determined since the angle $\ominus$ on the sides of the conical hole is pre-determined by the setting of the lathe-slides and is known within very accurate limits. Similarly depth (L) of the contact-pegs (K) is also known to be a precision dimension. From these known values for any particular workpiece, distance (X) is easily computed by means of the following simple trigonometrical formula. Its derivation is shown in the enlarged insert diagram in the upper right-hand corner of the drawing.

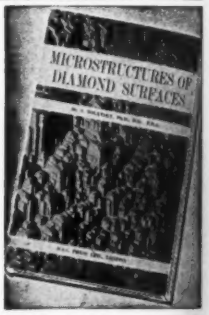
(1) . . . $X = L \times \text{Tan} \ominus$

It is then only necessary to add twice the value (X) to the previously measured dimension (M) to obtain the major diameter at the extreme mouth of the conical hole.

In the illustrated example given, length (L) of the contact-pegs (K) is exactly .3750". Hole

MICROSTRUCTURES OF DIAMOND SURFACES

by S. TOLANSKY, Ph.D., D.Sc., F.R.S.



The remarkable pictures obtained by Professor Tolansky in his research laboratory and reproduced in this book (many of them never before published) enable fundamental new deductions to be made regarding the nature of diamond surfaces and therefore of the growth of diamond.

The text is written for the general reader and includes an elementary introduction to the optical techniques developed by Professor Tolansky that make such photographs possible. These techniques enable height or depth features as small as one twenty-five millionth of an inch to be resolved and effective magnifications in depth of half a million times to be made by simple and inexpensive means. One hundred and forty-three of these extraordinary pictures are reproduced as special plates in this book. $8.50* per copy.

CONTENTS:

The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip?)
The Etching of Diamond
Diamond Cleavage
Optical Shadow Casting
Percussion (Pressure) Marks on Diamond
Polished Diamond
143 Special Art Plates

Huebner Publications, Inc., 1975 Lee Rd., Cleveland 18, O.
Gentlemen: Please send me_____copies of the book "MICROSTRUCTURES OF DIAMOND SURFACES" @ $8.50* per copy.

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____STATE_____

Open account shipments on company purchase orders. Otherwise check with order; please, no C. O. D.'s. *Ohio customers add 3% sales tax.

CIRCLE INFORM-A-GRAM KEY NO. 1573

(B) in the workpiece is bored with a side angle $\ominus$ which equals 9°. Dimension (M) as measured by the micrometer was found to be 2.3812".

Therefore:

$$(2)\ldots X = .3750 \times \text{Tan } 9°$$
$$= .3750 \times .1583$$
$$= .0594$$
$$2X = .1188$$

Thus the required major diameter of this hole is:—

$$2.3812" + .1188 = 2.5000".$$

With most published trigonometrical tables, tangent values are tabulated to four decimal places. Thus, far more accurate finished results are obtainable than by other conventional forms of measuring tools or gages.

It is only necessary to make the same simple kind of calculations for any diameter of conical hole being gaged. By making bar (E) of sufficient length, the gage can be adapted to suit practically any range of hole diameters.

Use of such a gage in the machine shop or inspection department removes all guesswork and inaccuracy in gaging holes of this character. In addition, much time may be saved in conducting such gaging operations. ΩΩ

• Write for literature on complete line of furnaces and ovens. Ask for Hints on Heat Treating.

Designed for TOOL ROOM EFFICIENCY

HUPPERT Heat Treating FURNACES

Range: 300° F. to 2000° F.

Years of satisfactory operation in tool, die and machine shops, as well as laboratories have proven these furnaces to be ideal for production work. Huppert special features include High Temperature, Heavy Duty Kanthal elements — Multi-insulation — counter-weighted and tight self-sealing door. Pilot lights indicate furnace operation. All connections factory installed, shipped ready for operation.

Model No.	Inside Dimensions			KW	Prices 220 volt single phase	
	Wide	High	Deep		with Huppert input controller	with electronic temperature controller
869	8"	6"	9"	4	$280.00	$480.00
11	8"	6"	12"	4	298.00	506.00
12*	8"	8"	12"	6	382.00	590.00
12A*	8"	8"	18"	9	490.00	698.00

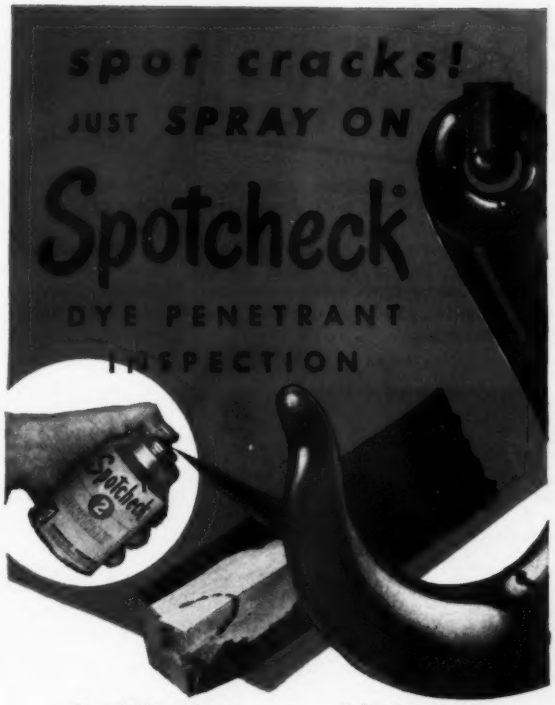
*For 2300° F. add $95.00 to No. 12 and $105.00 to No. 12A. No. 12A can be furnished for 3 phase at no additional cost. For floor model add $52.00 to above prices.

K. H. HUPPERT CO.

6820 Cottage Grove Avenue, Chicago 37, Illinois

Manufacturers of Electric Furnaces and Ovens

CIRCLE INFORM-A-GRAM KEY NO. 1591



Non-visible crack as detected on carbide tool.

Safety in maintenance, locates crack in crane hook.

FAST, EASY, LOW COST

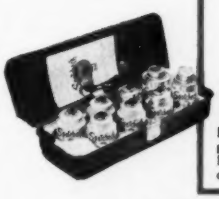
✓ CONVENIENT, EASY TO USE
Spotcheck—in pressurized spray cans.

✓ MAKES THE JOB EASIER
Detects cracks in tools, parts, machinery.

✓ ENDS GUESSWORK ARGUMENTS
Positively finds cracks, not scratches.

✓ NO OTHER EQUIPMENT NEEDED
No pumps, hoses, brushes, compressors.

✓ PORTABLE—USE ANYWHERE
Quick inspection in the field or plant.



COMPLETE, PORTABLE

SK-1 KIT

only **$35.00**

Plus $1.00 for packing and shipping, shipped prepaid. Add local sales or use tax, if any. Prices apply in continental U. S. only. Also available in bulk at low cost.

ORDER FROM YOUR DISTRIBUTOR

MAGNAFLUX CORPORATION

7339 W. Ainslie Ave., Chicago 31, Illinois

Quantity

☐ Please send us_____SK-1 Kit (s) at $35.00 each, plus $1.00 each, shipping and handling. Add local sales or use tax, if any.

☐ Send only Free Illustrated Bulletin now.

☐ Send information on bulk materials.

Name_____Title_____

Company_____

Address_____

City_____Zone_____State_____

CIRCLE INFORM-A-GRAM KEY NO. 1592

Woodrow W. Hamilton is the new sales manager who will direct the national sales activities for the Micronics Division, Elgin National Watch Co. In his new post he is in charge of contract sales involving sub-miniature, precision components, and assemblies.

Ernest L. Roberts, Jr. has been appointed company representative for The Ohio Knife Co. He is serving the metalworking industry within a 200-mi radius of his headquarters in Pittsfield, Mass.

◆

Robert N. Hamilton and **Robert P. Cooper** have been named abrasive engineers for Norton Co. Each man is covering part of Los Angeles, with headquarters at the district office there. **Gordon F. Colson** has taken over as a field engineer at the Huntington Park, Calif., office.

Fully automatic BURR-MASTERS
for deburring internal & external gears and splines
ABOVE: MODEL BMI-15 FOR INTERNAL GEARS
BELOW: MODEL BME-24 FOR EXTERNAL GEARS
• Entire tooth form including root deburred and chamfered at 5 teeth per second—automatic load, deburr and unload
• Production not limited to a single gear—changes in automation tooling permit wide work range
• Long-life form tools assure maximum production between grinds, rapid changeover
• Two-station BME-24 deburrs both sides of external gears from 5/8" to 6 1/2" P.D. Single-station BMI-15 handles internal gears from 2" to 20" P.D.
MODERN
Industrial Engineering Co.
14230 BIRWOOD AVE.
DETROIT 38, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 160

The promotions of **M. L. Backstrom** and **C. C. Krogh** have been disclosed by Firth Sterling Inc. Mr. Backstrom has taken over as assistant district sales manager in the Chicago district. Mr. Krogh is the assistant manager of the Carbide Sales Division, succeeding Mr. Backstrom, and also manager of the Distributor Sales Division.

◆

Samuel S. Whiteley, Jr. has been named to the newly created post of assistant sales manager at Hunter Spring Co. He is rejoining the firm after 3 years association with the Faultless Caster Co.

◆

Thomas J. Quinn has been appointed general sales manager at Grobet File Co. of America, Inc. He joined the firm's sales staff four years ago.

◆

David D. May is serving as factory sales representative for the Meco Oxy-Acetylene Welding and Cutting Apparatus Divisions, Modern Engineering Co. With headquarters in Memphis, Tenn., Mr. May is contacting distributors in the south central states.

◆

Philip R. Smith is the new assistant manager of Sheffield Michigan Sales Corp. in Detroit, a branch sales office of The Sheffield Corp. He has been associated with the company for over 12 years.

◆

Paul Eckstein is the Detroit sales representative for Clearing Machine Corp., division of U. S. Industries, Inc. He has been associated with the company since 1949.

◆

Wilbur Deutsch has been named sales manager of the Industrial Lubrication Department, Aro Equipment Corp. He is responsible for nationwide sales of industrial lubricating equipment.

◆

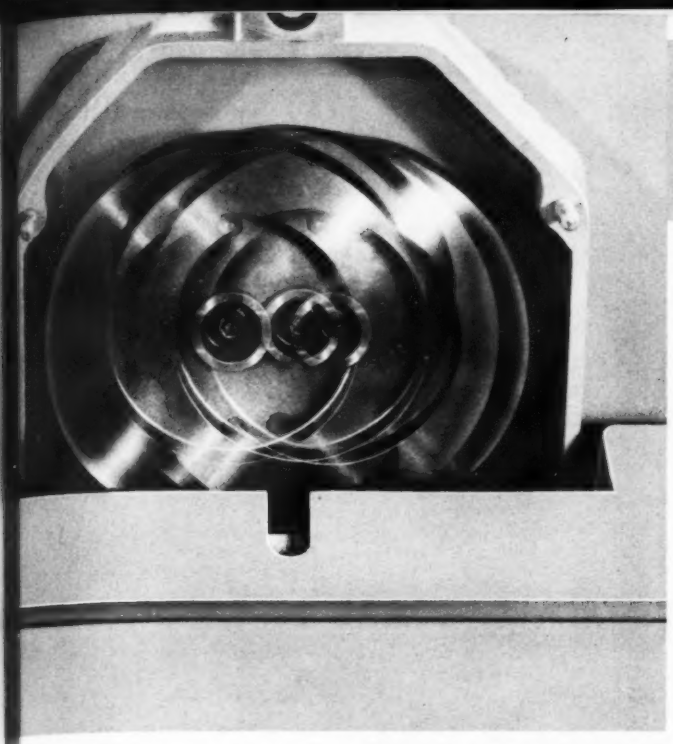
The new general sales manager of Vulcan Crucible Steel Division, H. K. Porter Co., Inc. is **Lester C. Hill.** Before joining the company, he was with Crucible Steel Co. of America and Jones & Laughlin Steel Corp.

◆

John E. Bashforth has become national and foreign field manager for Nichols-Morris Corp.

◆

The promotion of **R. P. Donnell** to the position of district manager of the Steel and Tube Division in New York City has been anounced by that division of The Timken Roller Bearing Co. **Ross Hershey** is the new district sales manager of the company's Buffalo area.



Multiple exposure shows the Wesson "TruArc" grinding wheel oscillation which takes skill out of grinding, produces micro-finishes, speeds tool grinding, eliminates wheel dressing. Stroke is adjustable.

carbide NEWS

Fast WESSON Poweramic grinder requires minimum operator skill

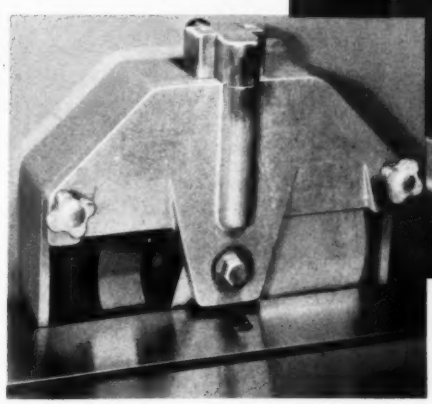
Carbide Grinding Made Easy

Grinding of carbides to hone-like micro-finishes is now reduced to merely placing the tool on the work table and lightly rolling the table into grinding position. That's all.

The Poweramic principle of true-arc wheel oscillation takes the work and skill out of grinding, and produces finer finishes at speeds far faster than any conventional off-hand grinder available in industry today. Further, this principle also keeps the wheel face dressed automatically.

Here are some other features: work table mounted on multiple concealed ball bearings, double-center-guided with two more ball bearings; work table mounted on trunnion with crank-adjusted table angle from 7° above to 20° below horizontal, as shown, on external permanent protractor; work table weight positively counter-balanced for all angular positions; bag-filtered coolant with adjustable flow from wheel center out across face; full splash protection by unique flip-over splash guard; safety stop for maximum protection against accidental gouging of wheel.

For full details on the Wesson Poweramic ask for Bulletin 56-A.

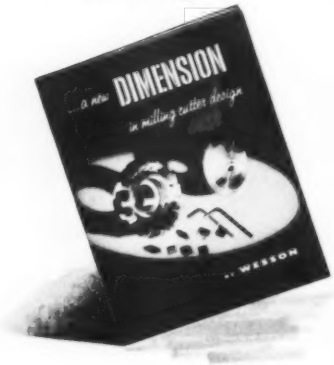


Four rows of ball bearings support and guide the work table. Angle is set with crank shown.

Unique flip-over splash guard (inset) permits both LH and RH grinding; lets operator see without getting wet.

carbide NEWS

"A New Dimension In Milling . . . . .



. . . Cutter Design" is the title of a 6 page bulletin describing the new concept of using "throw-away" carbide blanks in milling cutters rather than regrindable inserts. With blade cost reduced to as little as 17 cents per cutting edge, the bulletin tells of the economies possible in many milling jobs. Included in the concept is a new milling cutter design which permits high speed milling at high feeds, quick set-up; re-setting of blades right at the machine; inventory reduction; etc. Ask for Bulletin 556-B.

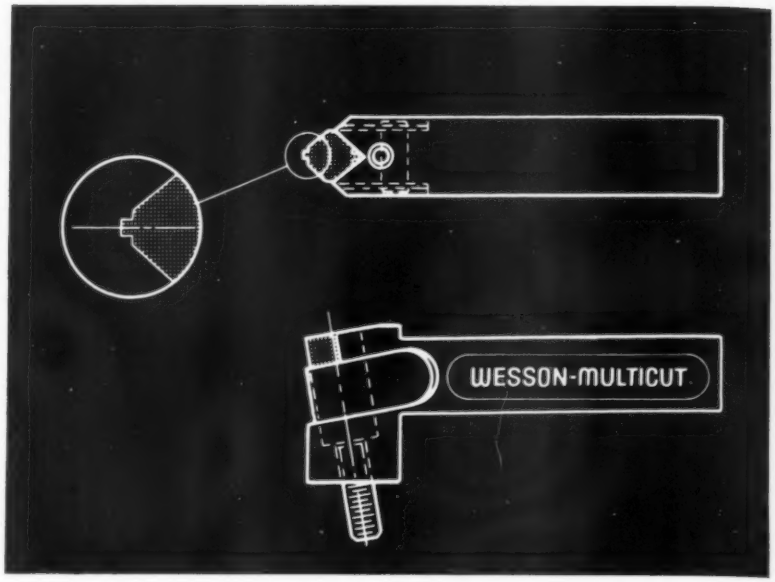
Wessonmetal Tooled Crank Lathes Show Tool Life Increase Of 29,900%!

Phenomenal gains in tool life despite almost quadrupled output are reported on Wessonmetal tooled Wickes and Le Blond crankshaft lathes, machining cast crankshafts. Output per tool grind has jumped from 30 cranks to 9,000. Production jumped from 11 to 40 cranks per hour. Wesson Multicut band-type tool holders were used. Tool cost dropped $1 per crank in one case, could reach total of several million dollars per year in that company, alone.

Wesson tools Wessonmetal carbide

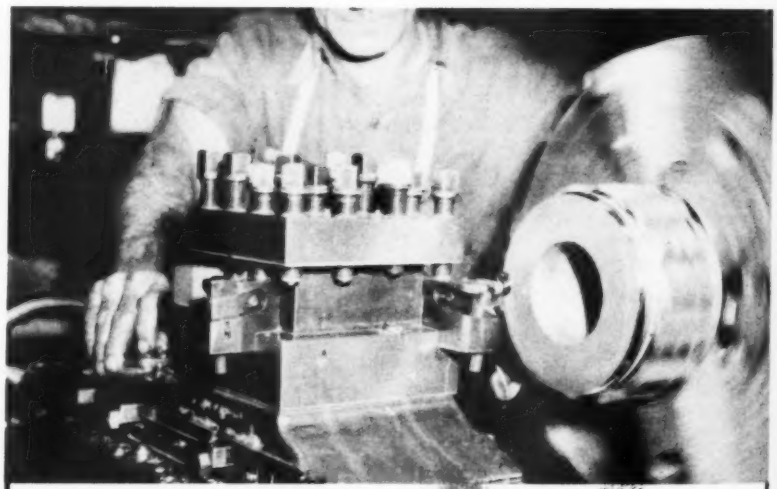
WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA: WESSON CUTTING TOOLS, LTD.
93 LEICESTER AVE., TORONTO 18, ONTARIO

Shaft Grooving Costs Cut with New Multicut Tooling



A new line of tools designed specifically for shallow grooving cuts has received such immediate acceptance in industry that it has been adopted practically as a standard for the machining of shallow grooves in automotive transmission shafts, for example.

Part of the expanding Wesson Multicut band-type insert holder line, the new tools have 4 "cutting edges" per grind—two at each end. Pieces per grind are way up over conventional tools; set-up and tool change down time is reduced to only a few minutes even for multiple tool set-ups. All replaceable parts except band and insert are standard. For complete data ask for Bulletin #DS-55-2. Insert dimensions are according to customers' needs.



All but 7/100 of one cent of a former tool cost of $7.98 per piece was eliminated on this tough job through the use of Wessonmetal WS in band-type Multicut holders. The operation—turning and facing a crane gear blank—was formerly done with a combination of steel and carbide (not Wesson) tools. Savings on just the first 4 pieces paid for the complete re-tooling.

HYDRAULIC OR MECHANICAL MACHINE MOTIVATION?

by Frank G. Zagar
President
ZAGAR, INC.
Cleveland, Ohio

PROBABLY THE BEST WAY to illustrate Industry's reasons for using hydraulic power is to recall our motives for the use of hydraulics.

For a number of years, we have been making a variety of hydraulic machines beginning with our 20" horizontal broaching machines, up to our present day activities — the building of complete large transfer machines. We have had experience in building all kinds of hydraulic and mechanical equipment for practically every conceivable type of operation.

We are 100% in favor of mechanical machines wherever practical. This stand comes from experience and from shades of my homelife. My father was a toolmaker and we always had mechanical projects going on around the house.

When it seemed sensible to use hydraulics, I found that I had to read and study circuits. I couldn't look at pipes and valves to determine how they worked; I am sure there are many others like me.

I found this to be true when we sent equipment to isolated spots around the country. The mechanics in these remote areas are for the most part practical men who are very capable of fixing anything mechanical. However, they are often completely lost and bewitched with hydraulic and electrical circuits. We frequently have to send our best men across the country to straighten out simple hydraulic and electrical troubles. As a result of these experiences, we have changed our design of **hydraulic** drilling machines to **mechanical,** and are replacing many of the existing hydraulic machines — both of our design and that of our competitors.

In spite of our inclination toward power sources other than hydraulic, we realize the necessity of wedding the systems to the best advantage, or leaning farther toward one system than another if it will accomplish the best desired results. Our first hydraulic venture was with our 20" broaching machine. We needed a broaching machine to produce the hexes and the squares in collets. Such a machine was not available since the war was in its early stages. So we were more or less forced to use our ingenuity to make the best out of what we had on hand. The process seemed rather simple — we needed only to pull comparatively small broaches.

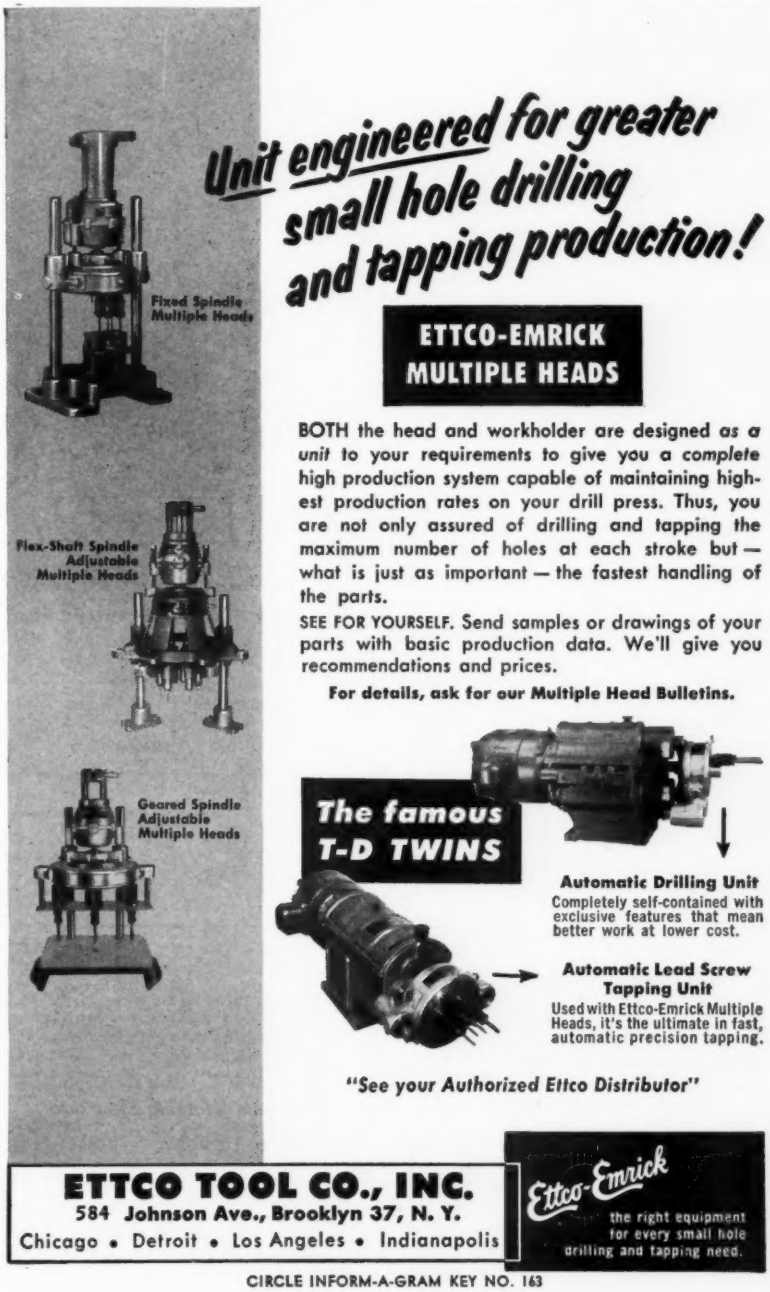
An old cylinder was available, 20" long, and a used B&S gear pump; around these we built a machine which satisfied our immediate needs. Our reasons for selecting hydraulics were those of availability and necessity.

Negative impressions of our first hydraulic creation were: a piston which constantly leaked, oil all over the place, and an extremely noisy pump. In addition, our homemade valves were a constant source of trouble.

Our final design of hydraulic broaching machines called for the best cylinder, pump, valves, connections, and pipes we could buy. If you are going to select hydraulics, use good standard components. Above all, don't try to make your own.

Incidentally, talking about noisy pumps — the major source of noise is from starving the intake port. Lack of oil creates a pulsing vacuum that pops off intermittently into a constant boiling. This is particularly true of some of the rotary pumps.

Adapted from Mr. Zagar's paper which he delivered at a meeting of the Machine Design Division, of the Cleveland Engineering Society, April 2, 1956.


Unit engineered for greater small hole drilling and tapping production!
Fixed Spindle Multiple Heads
Flex-Shaft Spindle Adjustable Multiple Heads
Geared Spindle Adjustable Multiple Heads
ETTCO-EMRICK MULTIPLE HEADS
BOTH the head and workholder are designed as a unit to your requirements to give you a complete high production system capable of maintaining highest production rates on your drill press. Thus, you are not only assured of drilling and tapping the maximum number of holes at each stroke but — what is just as important — the fastest handling of the parts.
SEE FOR YOURSELF. Send samples or drawings of your parts with basic production data. We'll give you recommendations and prices.
For details, ask for our Multiple Head Bulletins.
The famous T-D TWINS
Automatic Drilling Unit
Completely self-contained with exclusive features that mean better work at lower cost.
Automatic Lead Screw Tapping Unit
Used with Ettco-Emrick Multiple Heads, it's the ultimate in fast, automatic precision tapping.
"See your Authorized Ettco Distributor"
ETTCO TOOL CO., INC.
584 Johnson Ave., Brooklyn 37, N. Y.
Chicago • Detroit • Los Angeles • Indianapolis
Ettco-Emrick
the right equipment for every small hole drilling and tapping need.
CIRCLE INFORM-A-GRAM KEY NO. 163

From broaching machines we went to drilling machines. In drilling machines, we require a flexibility of feed rate and speed, because of the great variety of jobs to be performed. We also need various degrees of cycling and operational sequencing. We still had the usual difficulties with oil leaks, worn seals, hot oil, and burnt-out solenoids. However, we had to be satisfied with hydraulic drilling; it gave us our best performance in overcoming the surge characteristics of the machine components.

We did not get into any **serious** difficulties with hydraulics until we made a number of drilling machines that cycled over 30 times/min. I would like to say here and now, on speed cycling, go to mechanical components. Our first problem was how to stop the high speed 12″ and 24″ stroke feed cylinders and the rather heavy slide. The normal cushions that are usually provided for the ends of cylinders were not enough. They did not stay in adjustment. Extremely high pressures were hard on the seals. Eventually they became unusable due to considerable leakage and heavy pounding.

It is difficult to synchronize cylinders; much time is lost from limit switch to valve — to valve. Impulses take time to travel. Then, too, in high-speed hydraulic operations limit switches, relays, and solenoid valves soon beat themselves up, resulting in a continuous maintenance and upkeep problem.

As a result of our experience with high cycle hydraulic machines, we deemed it necessary to go to a completely mechanical machine in many instances.

Hydraulics are excellent when sequences of motion are not clearly defined, and where the operation to be performed is still in a somewhat experimental stage. Under such conditions, hydraulics may offer the ideal solution, inasmuch as feeds and speeds can be varied to suit the dictates of the job with little or no difficulty. After such feeds and speeds are determined, I believe it is time to go to mechanical components—linkages and motivation—to give optimum performance. This is exactly what we did with the design of our mechanical tile drilling machine. We established the required motions in the hydraulic machines and then were able to reduce them to mechanical motions. Potential production jumped 400%. Surprising, but true.

Our next major hydraulic machine, an automated transfer machine, involved some 26 stations. It wound up to be 30′ square with an electrical control panel 8′ high and 18′ long. The machine has a central hydraulic system for the transfer mechanism and individual hydraulic feed systems for each drill head.

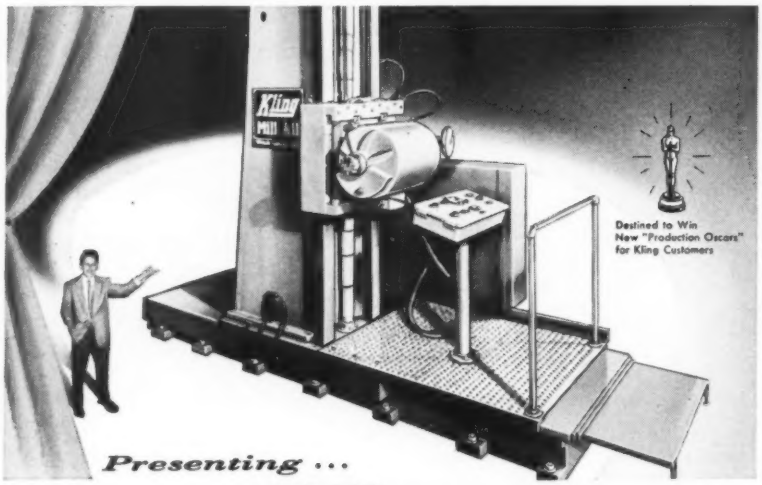
We received very expert advice and guidance from Bill Pew of J.I.C. Electric in Detroit, who is well versed in both hydraulic and electrical circuits.

I would not go to a pneumatically driven transfer; air is more difficult to control and is erratic.

I am pleased to report that, as far as individual hydraulic components are concerned, we certainly have a minimum of difficulty.

We have learned that there is just as much advantage to having hydraulic components in one basic package, as it is to having electrical circuits in one basic panel. In our first machine, we had hydraulic components spread over the complete area of the machine. Sometimes they were rather inaccessible and hard to reach. In the machine we are now building, we decided to put all the hydraulic components into one location, and string tubing from the valves to the cylinders. Our hydraulic circuit has been considerably simplified, and is easier to maintain.

Panel mounted components are being used for another reason — to confine leakage to one area. A hy-



Presenting ...

the New Kling MILL-ALL

... does more facing jobs faster and at lower cost!

This new high speed face milling machine offers exceptional power and capacity, is simply designed, easy to operate and enduringly built, as demonstrated by these construction details: Primary construction, welded steel; Vertical feed screw protected by telescoping tubular brass covers; Non-metallic ways used on both horizontal and vertical ways; Telescoping steel covers used to protect horizontal ways; Motor mounted on slide which provides for 10 inches of in-and-out travel of cutter. Send for data.

How this new machine Outperforms all others;

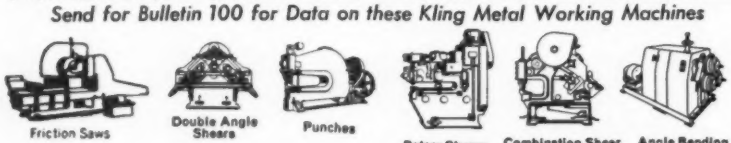
Some of its jobs	Feed Rates	Metal Removal Rate	Horiz. Cutter Travel	Vert. Cutter Travel	Motors	
Faces structural steel beams and columns and other steel sections and fabrications. Faces steel and iron castings, forgings, weldments, die blocks, etc. Does plate edging; can chamfer plates and bars (tilting head model) and can be adapted to mill aluminum and other nonferrous metals.	(Horiz. and Vert.) 40″ and 80″ per min.	Up to 60 cu. in. per min.	4 sizes 72″ to 144″	3 sizes 60″ to 84″	3 H.P. Horiz. and Vert. Gear Head Feed Motors with Brake	40 H.P. Spindle Motor Direct Drive 75 H.P. also available

Since 1892

Active Kling Distributors cover practically every marketing area of U.S. and Canada. Write us for name of one nearest you.

Kling BROS. ENGINEERING WORKS
1320 N. KOSTNER AVE. • CHICAGO 51, ILLINOIS
Exclusive Canadian Distributor: Brown-Boggs Foundry & Machine Co. Ltd., Hamilton, Ont.
Export Distributor: Simmons Machine Tool Corp., 50 E. 42nd Street, New York 17, N. Y.
Makers of Friction Saws; Shears, Rotary, Double Angle and Guillotine; Punches, Universal Beam and Single End Type; Combination Shear, Punch and Coper; Rolls, Angle and Plate Bending; Bulldozers.

Send for Bulletin 100 for Data on these Kling Metal Working Machines



1153TE

CIRCLE INFORM-A-GRAM KEY NO. 164

draulic expert will tell you that, regardless of how careful you are with hydraulic circuits, they will leak. If they don't leak on the initial installation, they will leak eventually, after replacements.

With the panel type of valves, it is possible to replace them without disconnecting any of the pipe fittings. Valves are made in two pieces, sealed with "O" rings. The sub-base piece is attached permanently to the panel and takes the pipe-fittings, whereas the body is replaceable. This system results in a minimum leakage. **What leakage there is, is easily controlled,** by a built-in pan under the control area.

The cycling of in-line transfer machines is, as a rule, rather slow. There is no split-second timing, to necessitate consideration of lost time in relays and valves. Hydraulics seem appropriate for this type of equipment.

In any type of automation equipment, we feel that there is one basic consideration — and this is to be held above all else — NOTHING IS TO BE TAKEN FOR GRANTED. If the hydraulic solenoid valve is energized to move a cylinder in one direction, it cannot be assumed that the cylinder will reach the end of its stroke. There must be a limit switch at the end of the stroke to indicate this function has been completed and that the machine is ready for a subsequent cycle or operation. It is for this reason that electrical panels for transfer machines can become quite involved.

Regardless of the skill employed in building a machine, trouble shooting is, at times, necessary. The pulpit control panel tells the operator where trouble exists, when the machine has stopped in its operation.

We found it necessary to make hydraulic cylinders more accessible for maintenance and replacement. Now we make a concerted effort, regardless of appearance, to keep hydraulic cylinders out in the open.

In the construction of any hydraulic machine, consideration should be given to the control of oil leakage. All of our machines have a tank or catch basin to catch the miscellaneous drippage.

As a result of my initial experience with accumulators, I have decided to use the two-pump system of quickly getting high volume at low pressure and high pressure at low volume.

Machines employing complete hydraulic motivation, or those which are entirely mechanical, are dependent on the competent use of either. Perhaps it might be better said . . . they depend on careful consideration and the proper choice of one or the other for the specific application.

'Farm Out' Q-C and Inspection

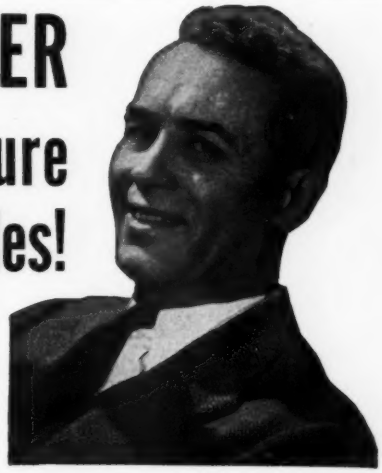
Small shops can have the full benefits of inspection and quality control by "farming out" their Q-C problems to a firm like Quality Control Corp., an independent inspection laboratory in New York.

The company's laboratory is equipped to inspect physical dimensions, surface finishes, and Rockwell hardness of machined parts. They also check and issue certified reports on all types of thread plug and thread ring gages, cylindrical plug and ring gages, gage blocks and all other types of gages.

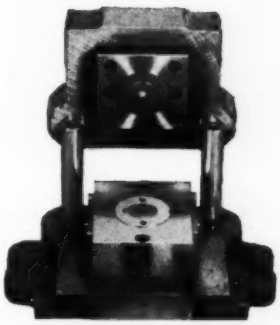
Its inspectors and technicians are equipped with technical knowledge and many years of experience in the field of Quality Control, as well as a practical understanding of manufacturing and inspection problems.

The company's air-conditioned facilities are located at 401 Broadway, New York 13.

"HOVIS WASHER DIES have sure solved our troubles!"



"You, too, should make washers the economical Hovis way. Save time, labor, materials and storage space"



Made in 5 sizes:
¾"- 1½"- 2½"- 4"- 6"
Write for Literature

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART

The modern method adopted by manufacturers nationally . . . These *Patented* Dies provide a Master Holder by which, upon simply and quickly removing and replacing Five, Small Interchangeable Parts, a new size washer may be produced . . . Special sets of parts available for use in these units . . . This method makes possible production of irregularly shaped pieces and shallow draws . . . Multi-Washer Dies designed and manufactured.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Phone: Slocum 7-4800

VAN DYKE, MICHIGAN
Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 165

. . . Design Molds, from Page 70

5. Porosity serious problem with cast molds.
6. Shrinkage and distortion of castings must be carefully compensated for.

Part Size

Small parts present their own problems; but, as the size of the parts increase, their production requires not only large, heavy, and expensive molds (which take longer time to produce), but also larger, more rigid, and more costly presses. Smaller parts can be molded in simple, fast-acting air presses. Large parts, with their greater areas, require hydraulic presses in order to obtain desirable unit molding pressures (100-150 psi and higher).

Complexity

The shape of the part will, of course, determine the method of manufacture of its mold. Simpler molds, such as one for a box whose sides are planes joined by circular radii, can be produced by such machining processes as plain or Bridgeport milling, shaping, or planing, either from solid blocks or in sections which are subsequently assembled. For parts whose shape is that of a surface of revolution, molds would, of course, be turned or bored in a lathe. Where irregular contours or curves other than circle arcs are involved, the mold halves may be Kellered, either from the solid (for smaller parts) or from rough castings or forgings (for larger parts, to reduce machining time by reducing amount of material to be roughed out).

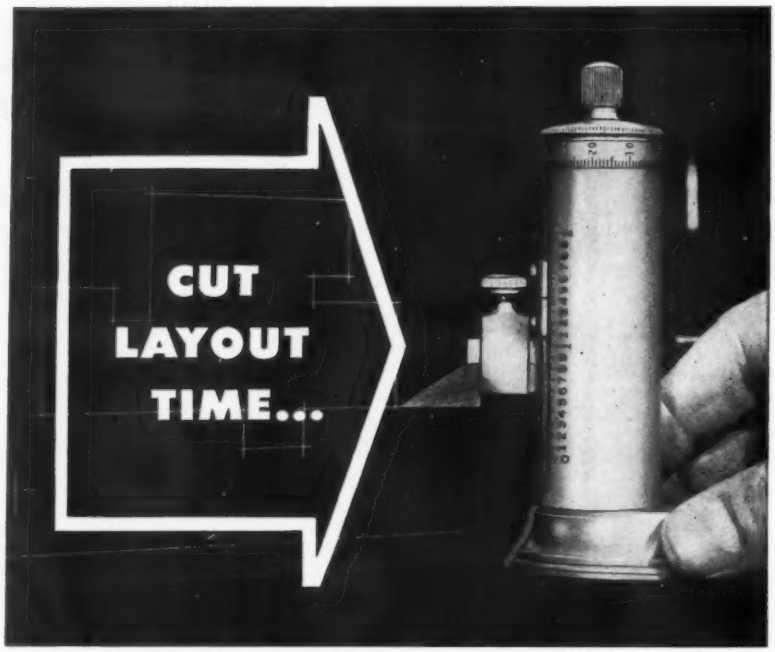
By careful work, molds may be cast nearly to finished size and shape, allowing a small amount of metal for "cleaning up" and polishing. Oversize castings may be finished to fit templates made to the desired contour or may be fitted to form blocks or masters of plaster, reinforced plastics, etc., by means of blueing and filing, grinding, or scraping.

Surface Finish

Where smooth surface and excellent appearance of the molded article are of prime importance, highly polished mold surfaces are essential. Where these factors of appearance are not involved, less effort, time, and expense are needed in polishing the mold after machining. In any case, however, a certain amount of polishing is required to eliminate cutter or grinding marks, or other surface irregularities which would interfere with ready stripping of the molded part. Chromium plating of mold surfaces often facilitates part release.

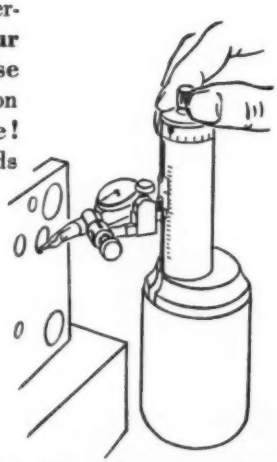
Trimming and Blanking

For larger production, it is usually necessary to make provision in the mold to trim off excess material and to blank or



with GREIST MICRO-HEIGHT® GAGE

Precision-built Micro-Height scribes like a vernier height gage...**reads faster than your micrometer!** You read direct from **zero at base** to 3". Hundredths on barrel...thousandths on large-diameter head that **cuts reading time!** Precision ground and lapped Riser extends range to 9".



CUT INSPECTION TIME!

Add your dial indicator to quickly read distances between holes, surfaces.

Precision-built, satin-chrome finished Micro-Height Gage quickly pays for itself!

Call your distributor or write:

THE GREIST MANUFACTURING COMPANY, 486 BLAKE STREET, NEW HAVEN 15, CONN.

Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 166

trim holes or other openings in the part during molding, thus eliminating or greatly reducing the need for subsequent machining operations. This can be done by mounting hardened tool steel inserts in each of the mold halves in such position as to shear through the reinforcing material in the desired areas of the part, as the mold reaches its closed position. Portions of the mold may be flame-hardened, if of ferrous construction, to produce good shearing edges.

Part Design Changes

Where the part to be molded is subject to frequent changes in design, as in the aircraft field, it is generally essential to keep mold costs low, even at the sacrifice of such otherwise desirable features such as automatic trimming. For parts of this nature the ease with which aluminum molds may be revised (by additional machining, welding, or addition of inserts), combined with their lower first cost, makes their use especially attractive.

Delivery Schedule

Where the customer requires long, continuous production runs of a part, the mold may be designed without special consideration for ease of installation on and removal from the press in which it is to be used. However, where 50 or 100 pcs are to be delivered per month and the molder is not permitted to produce more than a month or two ahead, as in making aircraft parts, he is faced with a quite different set of conditions.

To obtain maximum utilization of valuable press time, such molds must be designed for easy handling, quick mounting in and removal from the press, and simple, fast-acting connections to electric power or steam supply and drain lines. Methods which have been successfully adopted to gain those results include the use of light aluminum molds, standardized mounting plates designed for ready dogging or clamping to the press bed and platen, and mold heating by either plug-in electric power or steam platens which remain on the press and are designed to receive any of several molds interchangeably.

Having carefully considered the general factors outlined above, together with the many specific problems inherent in the particular part involved, the molder is ready to proceed with design of the mold. With the design completed, he can begin a much more difficult task—finding a reliable moldmaker who will build the mold in accordance with that design in the 10 days or 2 weeks that now remain before the date promised the customer, and within the low cost figure quoted by his sales department to get the job away from the competition.

How to Straighten Flap Tracks

Precision parts for aircraft call for the use of precision equipment.

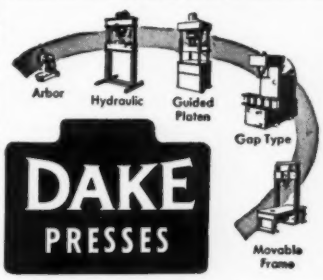
These flap tracks, machined from 4130 steel (aircraft quality), must be checked on a straightening press four times during fabrication. For ease of control and accuracy, the work is done on Dake Gap Type Presses like that shown in the photograph above.

To the right of the ram, the operator has placed a rule gauge which indicates ram travel. Knowing the elasticity of the piece being tested, he can estimate the overtravel necessary to straighten the piece with a single movement of the ram.

Dake Gap Type Press broaches boring bars

Dake Gap Type Presses are available for straightening or forcing, in 22 models ranging up to 300 tons capacity. They are fully described in Bulletin No. 299—sent on request.

Dake Corporation, 634 Seventh St., Grand Haven, Mich.



DAKE PRESSES

Send for Big New Catalog

DAKE CORPORATION
634 Seventh St., Grand Haven, Mich.

Please send me a copy of Dake Bulletin 299

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 167

THREAD INSERTED MASONITE REDUCES TEMPLATE COSTS

Fabricators of steel sheet and plate will be interested in the use of Masonite templates instead of steel for punching operations developed by the Ingersoll-Rand Company at their Painted Post, N. Y., plant. Strong, permanent threads in Masonite, to receive the steel screws which secure the punches in position on the template, are obtained by wire thread inserts of stainless steel made by the Heli-Coil Corporation, Danbury, Conn.

Metal sub-bases and housings for air compressors and natural gas engines are made at Painted Post of hot rolled steel (AISI #1025) from 20 gauge to 3/16" thick. Holes punched range from 3/32" to 2" dia. Templates are either 3' x 8' or 3' x 10' by ¾" thick and one template may have as many as 25 punches fixed to it—each punch held in position by one or two steel machine screws.

Up until six months ago Ingersoll-Rand used steel templates in which holes were drilled and tapped. Using Masonite, the total cost of templates including materials, inserts and labor has decreased from $200 to $80 each. In addition, the weight of the Masonite template is only 1/6 that of the steel templates. The Masonite templates can be handled manually without a hoist.

Fig. 1. Stainless steel wire thread inserts are turned into threads tapped in ¾" Masonite made up of three ¼" slabs glued together. As many as 25 inserts may be placed in one template. Cost is reduced from $200 to $80 for Masonite and weight is reduced to 1/6 that of steel.

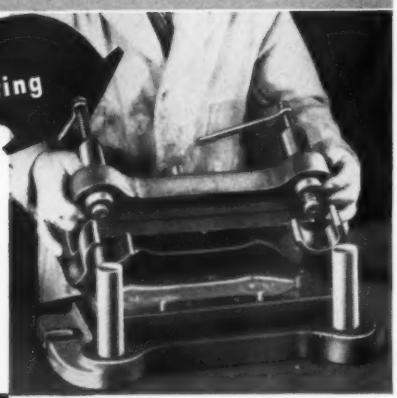
The Masonite templates are made of three ¼" slabs glued together for stiffness. The holes for the wire thread inserts are drilled, rough tapped and finish tapped. The inserts are turned into the tapped threads with an inserting tool (Fig. 1). The punches are placed on the template in the correct position for the part being punched and secured by the machine screw or bolt turned into the threads provided by the insert (Fig. 2). The sheet or plate is then punched (Fig. 3).

The Masonite templates are designed for repeated use. Unprotected

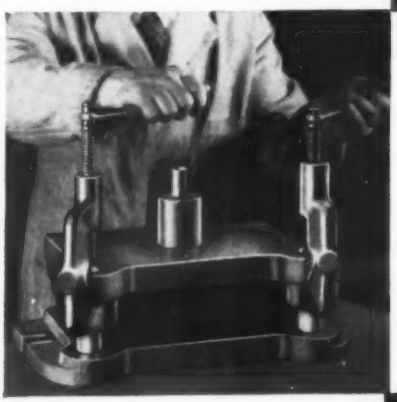
Fig. 2. Punch is placed in position and secured to template by steel screw. Insert provides stainless steel threads ½-13 x ¾ in Masonite to receive the screw.

ACRO DIE SET PULLERS

...with Indexed Screw Wrenches for Uniform Lifting



Here's the die set puller for uniform, easy lifting of die sets. The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving freely from both leader pins simultaneously. This is accomplished only by use of the *indexed* screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers. They are available in three sizes and further descriptive material will be sent upon request.



OTHER ACRO PRODUCTS

Consist of modern drill rod racks, leader pin oilers, wing nuts and automatic lubricators. Write for additional information. Ask for bulletin TP-56P.

ACRO
METAL STAMPING CO.
340 E. RESERVOIR AVE.,
MILWAUKEE 12, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 168

threads in Masonite would not be strong enough to resist the torque required to secure the punches to the template or permanent enough to resist the wear of repeated use. Inserts provide ½-13 x ¾ threads in this application, but are made in all standard thread sizes.

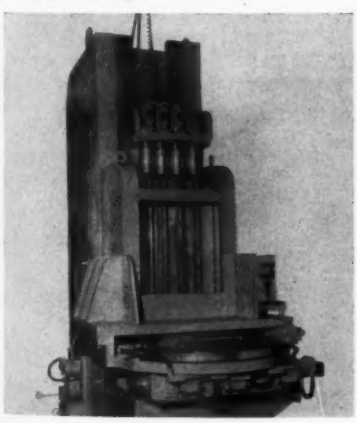
Fig. 3. With the required punches in position on the template and secured by screws in stainless steel threads, steel sheet or plate up to 3/16" is punched.

Holes Broached Automatically at 560 Per Hour

Automatically broaching ⅞" max dia punched holes in automotive lever arms is being performed on a 15-ton, 66" stroke Colonial pull-up machine, at the rate of 560 pcs/hr. The finished broached holes have a 1-5/64" dia.

The machine, made by Colonial Broach & Machine Company, Detroit 13, has four broaches which are pulled through the lever arm holes on each broaching stroke. Five different type parts may be broached on this machine by mounting their corresponding set of face plates on the rotary indexing fixture. The fixture is automatically indexed by a special hydraulic circuit which is interlocked with the machine circuit for continuous operation. This feature permits operation of the machine at 100% of capacity.

Broaching holes in automotive lever arms at 560 pcs/hr is the job of this Colonial 15-ton, 66" stroke, pull up machine. Broaching operations are continuous. Parts are loaded at front, automatically discharged at the right side of the automatic rotary indexing fixture.



One of five different types of lever arms that are being broached. Punched holes (at left) are ⅞" max. dia. Broached holes (at right) are 1-5/64" dia.

The rotary indexing fixture has three indexing positions for broaching and three indexing positions for broach return. This permits loading any of the five different type parts side by side while parts are being broached in the broaching position, with the third broaching position being used for automatic unloading of the broached parts.

Lever arms being broached vary in length from 6⅜" to 8⅜", while the depth of broached holes is 1-1/32" on all five arms.

FG FONDA
GAGE BLOCKS

QUALITY . . . . Lasting precision — in millionths.
PRICE . . . . . Traditionally low prices in spite of rising costs.

Square or Rectangular
In steel and carbide
with
Accessories

D. C. FONDA GAGE CO.
200 HENRY ST., BOX 1050
STAMFORD, CONNECTICUT

For completely new 1956 catalog, clip this to your company letterhead and mail.

NAME_____TITLE_____
COMPANY_____
BUSINESS ADDRESS_____
CITY_____STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 169

Carbide-Tooled Tracer Lathe Ups Metal Removal

Eighteen pounds of metal per minute! That's the amount of steel Improved Machinery Inc., Nashua, N. H., maker of paper and pulp processing equipment, removes in machining an important equipment component — by combining the efficiency of a tracer-controlled lathe (Fig. 1) with proper carbide tooling.

An important element of the vaned rolls is shown in the foreground of Figure 3. This part is machined from a single billet of mild steel with dimensions of the journal end held to close tolerances, which subsequently is fitted with a stainless steel sleeve prior to roll assembly.

The part, which measures slightly over 22", formerly was machined in an engine lathe. In taking down the 7" stock to 6¼", and machining the required steps, about 6 hrs of labor were charged to the job. This meant that only two roll components could be produced in one day.

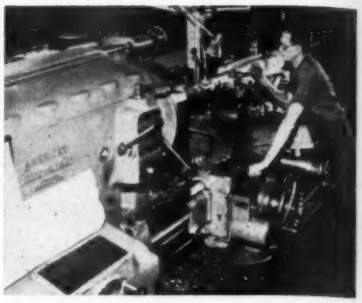


Fig. 1. Overall view of American Pacemaker, tracer-controlled lathe employed by Improved Machinery to shape vital roll part using only one carbide tool to complete all operations.

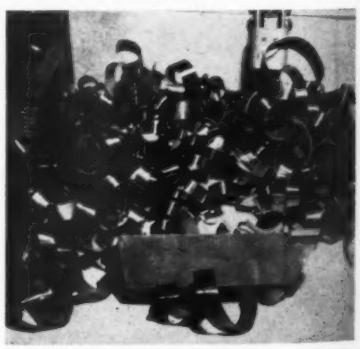
The same part now is produced in about 1½ hrs, due in part to a carbide cutting tool, and in part to the 25", 40-hp, tracer-controlled American Pacemaker lathe employed.

The carbide, Carboloy grade 370, eliminates tool changes during the machining of a part and, in spite of the heavy cuts, machines 8 to 9 complete pieces — a day's run before requiring resharpening. The lathe, after the initial template is made, eliminates considerable setup time and assures repetitive accuracy. Machining the template requires about ½-hr, including inspection by both the operator and inspector.

The 1020 steel billet is machined at speeds between 500 to 800 sfpm. At these speeds the work pulls about 50 hp from the machine. A four-step operation, the job calls for roughing and finishing, each sequence requiring about ½-hr.

Because of the terrific heat generated, and the fact the sleeve diameter is fussy, the operator makes it a practice to remove the part from the machine after roughing to allow

Fig. 2. Eighteen pounds of chips per minute are removed by this Carboloy grade 370 carbide cutting tool (foreground) in machining a vital part for vaned rolls.



CARB-O-PLATING

brings you CARBIDE WEAR LIFE

at Substantially Lower Cost

By the application of a thin wear-resistant coating of tungsten carbide—by means of the Linde Process—the life of gages, parts and tools is extended many times over.

Carb-O-Plating as employed by Lincoln Park offers you definite advantages. It provides the wear life of carbide at a cost considerably lower than when solid material is used. And because it is applied over a steel base, the products have resistance to mechanical shock and are not subject to breakage as can occur with sintered carbide. The process also makes possible the highest degree of accuracy in finished products.

In addition to these features, Lincoln Park offers the extra advantage of extremely fine finishes—characteristic of all the company's precision products. Full information on Carb-O-Plating is yours for the asking. Write today.

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

1719 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 170

Fig. 3. The 1020 steel billet, left, and the 22" finished part are shown in the foreground. The carbide cutting tool produces 8 to 9 pieces—a day's run before requiring servicing.

for cooling. No coolants are used during the entire operation.

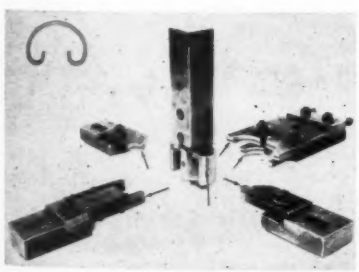
Average depths of cuts for roughing are 5/8" to 3/4" with a feed of 0.021". While finishing, the tool is fed at 0.016".

The Carboloy grade 370 carbide tool is a left-handed tool with a 1/32" nose radius, 7° side and end relief, 0° side cutting edge angle, and end cutting edge angle of 10° to 15° with 27° secondary end cutting edge angle. The tool also has a 0° back rake and 6° positive side rake. The chip breaker, running parallel with the tool, is about 0.125" wide, and 0.018" deep.

Flame Plated Wire Forms Increased Production 74%

By Flame-Plating wire forming mandrels with tungsten carbide, one manufacturer increased production by 74%. The wire forming tools shown slide in a horizontal plane to make a wire spring or clip around a vertically positioned mandrel. A hard, wear-resistant coating of tungsten carbide was Flame-Plated on all surfaces and grooves of the forming tools which come in contact with the spring wire stock.

The Flame-Plated tools were reported to last ten times longer in operation than the previously-used hardened tool steel parts. In addition, it was discovered that the machine speed could be increased so that production was raised from a normal 45 pcs/min to 78 pcs/min . . . a 74% increase. The four Flame-Plated forming tools were left in the condition as coated (about 125 micro-inches rms). However, the tungsten carbide coating on the vertical mandrel was brush finished to 50 micro-inches rms to provide a smoother surface.



Flame-Plating, a service of Linde Air Products Company, a Division of Union Carbide and Carbon Corporation, is being used to solve wear problems on many parts and tools. Tungsten carbide coatings can be Flame-Plated on most metals without danger of distortion, since the temperature of the base metal seldom exceeds 400° F during the coating operation. The coating may be finished to 0.5 micro-inches rms by diamond grinding and lapping or left in the condition as coated where tolerances permit.

All Makes • Types and Sizes High Speed
Precision Boring and Grinding (including Hi-Cycle Units)

SPINDLES REPAIRED

IN HOURS . . . NOT WEEKS!

Also Anti-Friction Live Centers Restored to Original Accuracy

Air conditioned repair center, trained mechanics and immediate availability of all types of bearings required in these units. We guarantee satisfaction and prompt service!

Bearings, Inc.

3634 EUCLID AVENUE • CLEVELAND 15, OHIO
Branches in OHIO • INDIANA • PENNSYLVANIA
WEST VIRGINIA • NEW JERSEY • KENTUCKY

Gentlemen:

I'd like to have complete information on your spindle repair service.

Name_____

Firm_____

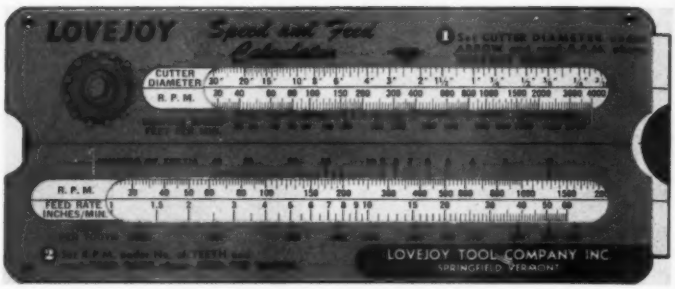
Address_____

City_____ Zone_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 171

SHOP

The Speed and Feed Calculator features 2 sliding tables on this side. The first table gives the cutter rpm and the second, the feed rate in ipm. On the opposite side is a carbide blade selector. The material to be cut is selected and the list number of the blade is read opposite the type and diameter of the cutter. Also given are the radial and axial rake angles for the material. For a copy of the Speed and Feed Calculator, contact Lovejoy Tool Co., Inc., Springfield, Vt., or — **Circle No. C1.**



"Use of CO_2 in Tungsten Inert Gas Welding." The manual is a guide to proper usage of torch equipment when using carbon dioxide shielding. Discussed are arc characteristics, CO_2 as a back up gas, electrode contamination, and liter scale flow meters and calculations. Also covered are making the weld, operating economies, torch handling, and weld appearance. The section on getting acquainted with carbon dioxide gives state changes of gas, cylinder data, and reminders on cylinder handling. Request copies of the illustrated manual from The Liquid Carbonic Corp., 3100 S. Kedzie Ave., Chicago 23, or — **Circle Inform-A-Gram No. C2.**

A Pocket-Size Card explains the new Ryerson steel color identification system, showing the various colors used to identify carbon steel bars, alloy steel bars, and steel plates. Single colors are for standard carbon and carbon manganese steels and 2 colors for alloy steels. Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, or — **Circle Inform-A-Gram No. C3.**

"Metal Stampings in Small Lots" shows in detail the know-how of production die-cut parts in limited quantities. With the Dayton Rogers process, die-cut stampings of practically any size or shape can be blanked, formed, and drawn of any material. The maximum blank size is 22" x 22" and the maximum thickness, 3/8". Included are diagrams of the parts that can be produced and photos showing examples of the economical use of short run metal stampings. One section deals with suggested basic designs for metal stampings. Dayton Rogers Mfg. Co., 2824 — 13th Ave. S., Minneapolis 7, will provide copies of Form 151, or — **Circle No. C4.**

The Use of Swiss Precision Hand Files in the production line is shown in Bulletin 356 from Grobet File Co. of America, Inc., Carlstadt, N. J. Included are photos illustrating the techniques of many hand filing operations necessary to insure the accuracy of small production parts. Several hand filing operations which put the finishing touches on parts are explained. In addition, a wide selection of Grobet Swiss precision files are cataloged. **Circle No. C5.**

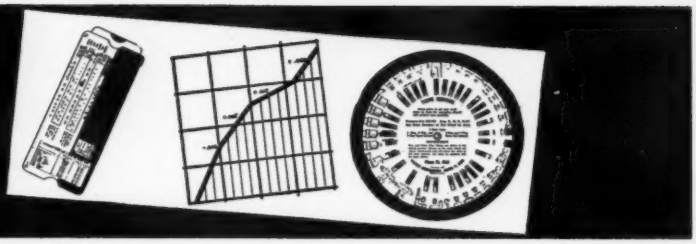
A Hand Stoning Handbook tells how stoning cutting tools pay off in better cutting speed, higher quality finishes, and longer tool life. It explains what a good cutting edge is and how to obtain the proper cutting edge for a milling cutter. One section lists the types of oilstones

available and describes each. In addition, the handbook contains complete descriptions of stone sizes and shapes for tool makers, die makers, master machinists, and model and instrument makers. Direct requests for the Hand Stoning Handbook to Dept. H., Behr-Manning, Div'n of Norton Co., Troy, N. Y., or — **Circle No. C6.**

Small Precision Instrument Ball Bearings are highlighted in a new, comprehensive technical reference manual and catalog. The 30-page book features a basic survey article, "Factors to Consider in Selecting Small Instrument Ball Bearings," written by Ralph S. Blanchard, Jr., professor of mechanical engineering, Northeastern University. Stressed are such considerations as types of bearings available, materials, components, engineering standards, tolerances, and the computation of dynamic and static loads. Other key factors discussed include handling methods and lubrication. One section is devoted to applications. The book also has a series of engineering bulletins bound into the back. The book with illustrations, charts, and nomographs is made available by New Hampshire Ball Bearings, Inc., Peterborough, N. H., or — **Circle No. C7.**

"How and When to Hob." This booklet on die hobbing procedures and problems explains many of the fundamental principles of die hobbing. It shows not only some of the applications for hobbed cavities, but also fields where hobbing can be applied other than plastic molds, such as die cast molds, metal forming dies, and rubber molds. The booklet points out the potential value of hobbed cavities in the making of good tools. The contents cover When and How to Hob, Important Data about Hobs and Hobbed Cavities, How to Treat Hobbings, and Newark Die's Heat Treating Service. Also pointed out are Newark Die's facilities for producing hobs, hobbed cavities, and machined molds. Newark Die Hobbing & Casting Co., 20 Scott St., Newark 2, N. J., will supply copies of the booklet, or — **Circle No. C8.**

AIDS



Optical Tooling is the subject of a brochure from Keuffel & Esser Co., 300 Adams St., Hoboken, N. J. First, 4 fundamental questions are asked and discussed—Is it straight?, Is it flat?, Is it plumb?, and Is it square? The next section deals with questions and answers relating to specific problems, such as—What can be done to cut tool and machine downtime?, Is there a means of overcoming excessive vibration at its source?, etc. In the last section are photos of some of the results of optical tooling. **Circle No. C9.**

"Factors to Consider in the Selection of Automatic Transfer Switches" lists the 10 features needed for adequate design and explains why they are essential. Other topics covered include Selection of Type, How to Specify the Switch Capacity, etc. Obtain Bulletin 596 from Automatic Switch Co., 391 Lakeside Ave., Orange, N. J., or — **Circle Inform-A-Gram No. C10.**

A Technical Bulletin on Ballizing has been published by Industrial Tectonics. Ballizing is a high-speed process for hole sizing and finishing. The bulletin, in addition to detailing the ballizing process, lists the production and cost advantages and explains the determination of ball size. Technical Bulletin 521 and a data sheet on ballizing are supplied by Industrial Tectonics, Inc., 3684 Jackson Rd., Ann Arbor, Mich., or — **Circle Inform-A-Gram No. C11.**

"Air, Water, and Industry" describes moisture problems and what can be done about them. The story of why there is moisture in air lines, how it got there, and its destructive action is told with animation. The

booklet also deals with what happens when air is compressed. A chart gives the approximate air needs of air tools in cfm. Copies of the booklet are released by Van Products Co., 5778 Old Ridge Rd., Erie 7, Pa., or — **Circle No. C12.**

A Chart issued by Punch Products Corp., 3804 Highland Ave., Niagara Falls, shows the approximate pressures for punching round holes in mild steel. It covers metal gauges from 28 through 1" and thicknesses from 0.015" through 1.000". In addition, the approximate pressures needed for notching are given. **Circle Inform-A-Gram No. C13.**

"The Dew Point Story" contains easy explanations of technical terms such as dew point, relative humidity, and saturation point. In nontechnical language the booklet describes the workings of a typical plant compressed air system. An analogy is given to explain such terms as dew point, etc. Also discussed is how moisture vapor in compressed air can be eliminated through dew point. Get your copy of the booklet from Hankison Corp., 410 Biltmore Bldg., Pittsburgh 16, or — **Circle Inform-A-Gram No. C14.**

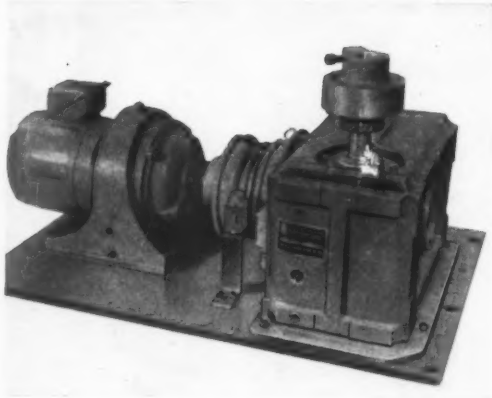
A New Technical Report includes the latest information for applying cemented oxide tool materials. It covers Carboloy's initial grade 0-30, describing tool holders required and metals machined to date. Given is tooling information such as cutting angles, chip control, cutting speeds and feeds, coolants, and regrinding. Also included is data on several test applications and results obtained. For copies of Report GTO-103, contact Carboloy Dept. of General Electric Co., Detroit 32, or — **Circle Inform-A-Gram No. C15.**

A Pitch Diameter Chart is now available from Quality Control Corp., 401 Broadway, New York 13. The chart covers thread work plugs and thread rings and setting plugs for American National and Unified "go" and "no go". On one side is the data for sizes from No. 0 through 7/16" and on the other, from ½" through 1½". **Circle No. C16.**

All JIC Symbols for Pneumatic Valve Controls are listed in this 40-page booklet. The simplified drawings in each category can be used to designate the pneumatic equipment of any manufacturer. The drafting template guide which accompanies the booklet, is an aid in the quick drafting of the desired symbols. The coding system in the booklet keys each of the symbols to the guide code and to the Ross catalog number. The booklet with the drafting template guide is available for $1.00 from Ross Operating Valve Co., 120 E. Golden Gate Rd., Detroit 3.

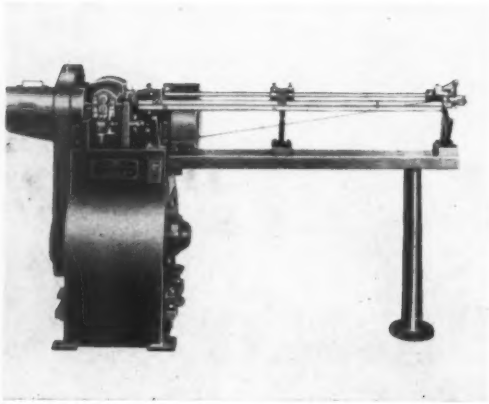
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



PACKAGED POWER UNIT . . .

A power-indexing unit for straight line transfer machines or other indexing equipment is now available from Ferguson Machine & Tool Co., Roller Gear Div'n, P.O. Box 5841, St. Louis 21. The standard components mounted on a steel base plate, are ready for inclusion in a machine. The indexing mechanism has an accuracy of 0.001″.
Circle No. A1.



WIRE STRAIGHTENING AND CUTTING . . .

A solenoid-actuated roller type clutch and cut-off cam are features of the Shuster Model A fine wire straightening and cutting machine. Its capacity is 0.020″-0.040″, or 0.025-1/16″ dia basic wire. Mettler Machine Tool, Inc., 150 Adeline St., New Haven, Conn., or —
Circle No. A2.

"HOLD-DOWN" VISE . .

The low design of Model 3 "hold-down" vise makes it adaptable for surface grinding non-ferrous metals. It works equally well for smaller milling jobs. The work is held so accurately that many secondary grinding operations can be eliminated. Illinois Metal Products, 429 W. Superior St., Chicago 10, or —
Circle No. A3.

INTERFEROMETER . . .

Measure changes in angle of arc to 0.000001″ accuracy with an experimental alignment interferometer developed by Bausch & Lomb Optical Co., 635 St. Paul St., Rochester. It can be rested on its side, base, or end to measure the alignment of jigs, fixtures, or flat bed surfaces.
Circle No. A4.

SWAGING MACHINE . .

This machine is one of the new rotary swaging machines introduced by The Torrington Co., Torrington, Conn. The new models incorporate provisions for

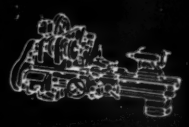
improved noise control and for accommodating a wide variety of feed attachments. The swagers eliminate the waste of ordinary machining while maintaining the full strength of metal.
Circle Inform-A-Gram No. A5.

TOOL GRINDING . . .

Equipped for either wet or dry face grinding of large, single-point tools is this double-end tool grinder. Style 48-B can be used for roughing out all sizes of shanks. With suitable wheels,

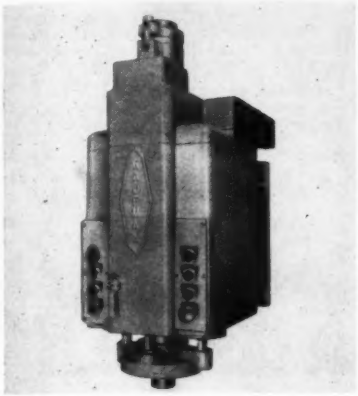
the machine will recondition tools of high speed steel, cast alloys, and carbides. A pressure coolant system is provided. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or —
Circle Inform-A-Gram No. A6.

ON PARADE



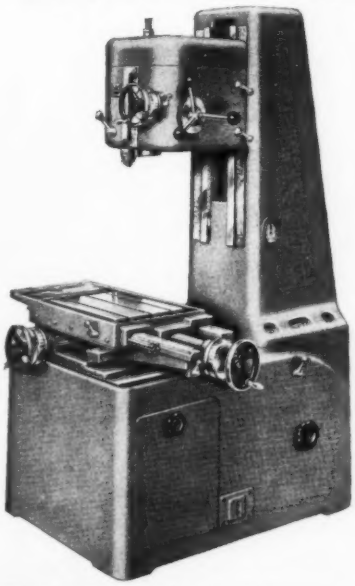
Mail FREE Inform-A-Gram Card for MORE Details.

TAPPER . . .
Accurate male or female threads are produced with minimum maintenance or setup time. New 101 Series will handle 3/8" UNC to 2" UNC in steel, 1/8" NPT



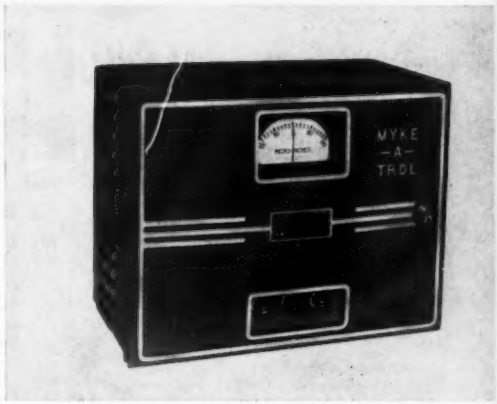
to 2" NPT in steel, and up to 5" dia with finer pitch threads depending upon the material. Kaufman Mfg. Co., Manitowoc, Wis., or — **Circle No. A7.**

DRILLING MACHINE . . .
Type AV-1 co-ordinate drilling machine will make jigs and gages, and production manufacture parts. It will produce holes to tolerances at accurate distances apart without using jigs.

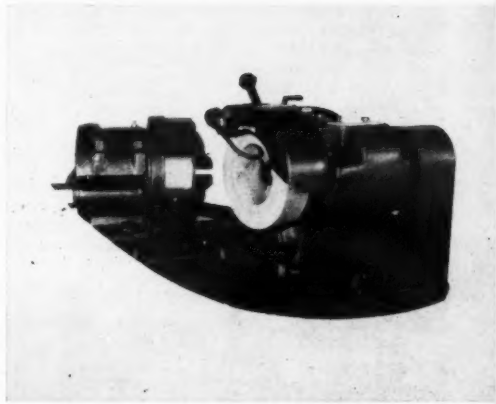


Details are in a bulletin from Intermachinery Corp., 452 — 5th Ave., New York, or — **Circle Inform-A-Gram No. A8.**

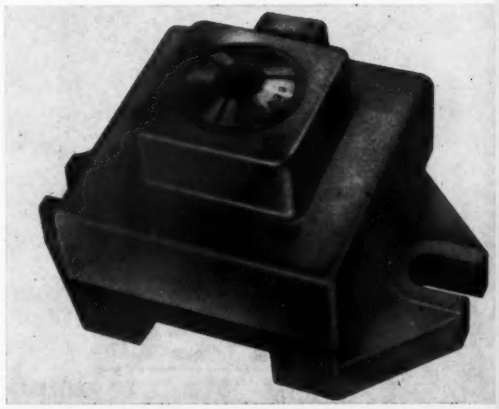
ELECTRONIC CONTROL . . .
Control quality during actual processing with Myke-A-Trol electronic control. It is used for gaging and sorting, pressure control, fatigue testing, inspection, and thickness control. This system of measurement has an overall accuracy of 2% using standard transducers. Industrial Electronics, Inc., 8060 Wheeler St., Detroit 10, or — **Circle No. A9.**



DRILL POINTER . . .
Model 510 semi-automatic wet drill pointer is now available with 2 alternative methods of supplying the coolant. The first alternative method is the substitution of "water through the wheel." The second consists of this method and direct discharge of the coolant. Oliver Instrument Co., 1436 E. Maumee St., Adrian, Mich., or — **Cricle No. A10.**



COLLET FIXTURE . . .
Simplify secondary operation work on parts that can be chucked in a standard 5-C, 1" dia maximum capacity collet with an air-operated collet fixture. The "Air-Pal" provides positive 2-way power and has a 75-lb pull at 100-lb air pressure. Beckett-Harcum Co., Wilmington, O., or— **Circle No. A11.**



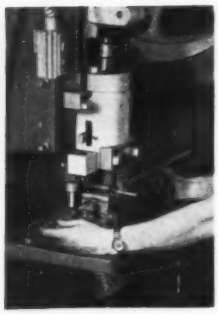
SOUND TESTING . . .
An electronic 'ear' that automatically inspects and rejects gears based on operating sound level is incorporated in a new gear speeder. Red Ring Model GSR handles the smaller sizes of pinion gears and is completely automatic. National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, or — **Circle No. A12.**

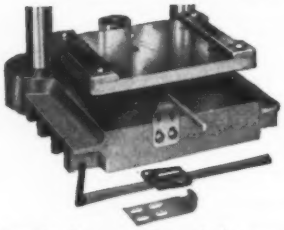
Adjustable Automatic Stock

FEED STOP for DIES

Dahlstrom **Light Duty**

AUTOSTOP





No drill jig...
No slotting...
No milling...

$1.75

Tested and improved through the years, the Dahlstrom Autostop will save hours of your high priced labor. Adjustable to work with blanking, progressive and compound dies. Mounts on stripper plate in 15 minutes. Handles sheet steel up to 1/16" x 6" or equivalent weight.

TO INSTALL: Just drill one 7/32-inch hole, then drill and tap four mounting holes per directions. That's all there is to it!

Trial order **$1.75** each; lots of 12 $1.50 each. State whether for use on compound or progressive dies. *Write for free pamphlet.*

By the makers of the **DAHLSTROM TAP GUIDE**

Branch MANUFACTURING COMPANY

16 OLSON DRIVE • NORTH BRANCH, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1761

KEEP YOUR MACHINES LEVEL

With EMPCO leveling jacks!

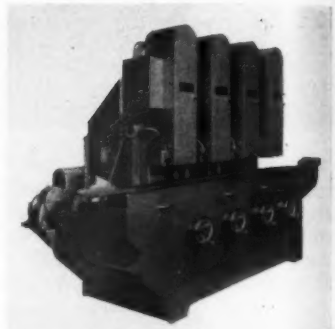
For peak efficiency and longer life, level your machines with EMPCO Jacks! Easily installed and re-located, EMPCO Jacks provide quick, easy machine set-ups *plus* smooth, positive adjustment! Used with VI-SORB mounting pads, Empco jacks control vibration, reduce noise, prevent creepage and cut machine maintenance costs!
In many cases they eliminate the need of anchor bolts in installations.
Available in six styles and 25 models, Empco's are designed to meet your requirements. Write today for complete information and illustrated bulletin!

EMPCO PRODUCTS

THE ENTERPRISE MACHINE PARTS CORPORATION

2735 JEROME AVENUE • DETROIT 12, MICHIGAN

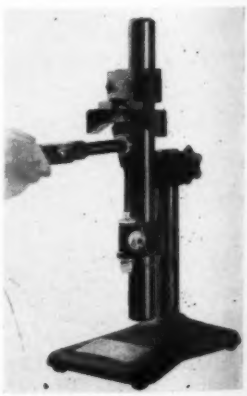
CIRCLE INFORM-A-GRAM KEY NO. 1762



Four Simultaneous Grinding Operations are performed by a conveyor-type abrasive belt grinder. Model 680-4 is designed for high-volume flat surfacing of ferrous and non-ferrous metals, plastics, etc. The four-head belt grinder produces extremely fine micro-inch finishes to exacting tolerances and is applicable to both wet- and dry-belt grinding. Engelberg Huller Co., 831 W. Fayette St., Syracuse 4, or — **Circle Inform-A-Gram No. A13.**

A 12" Dia by 1" Wide Drum Sander has been added to the line of rubber cushioned abrasive drums produced by American Diamond Saw Sales, 120 N.W. Ninth Ave., Portland 9, Ore. The Cone-Loc drum sander permits the use of ordinary strips of abrasives instead of belts or clipped end strips. **Circle No. A14.**

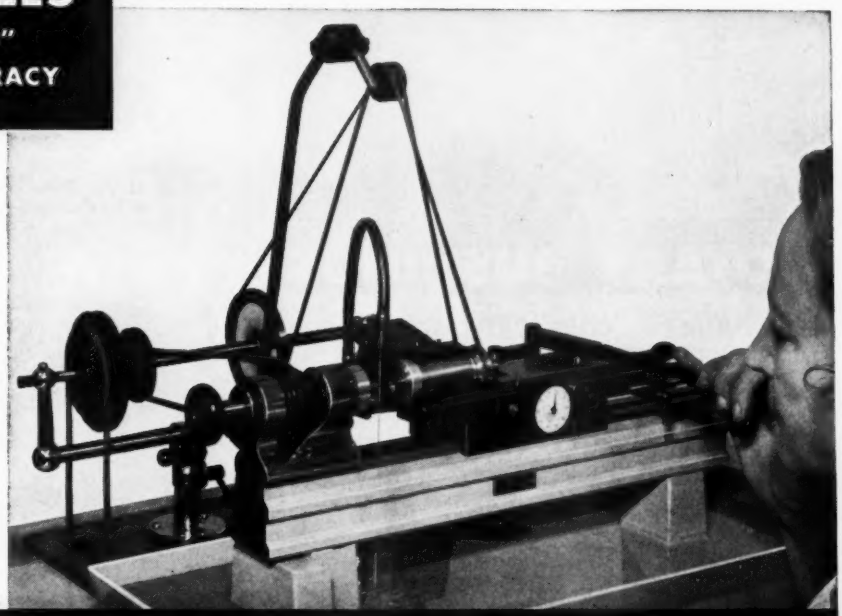
Automatically Cut Internal and External Threads, right and left-hand taper, and multi-start with a new automatic threading lathe. Model 1240 single point thread cutting machine is 1000 lbs heavier than previous models and is equipped with a secondary gear box for producing multi-start threads. The machine has a capacity of up to 55" of actual thread length. Man-Au-Cycle Corp. of America, 132 — 53rd St., Brooklyn, or — **Circle Inform-A-Gram No. A15.**



This Dial Bore Gage Setting Master can be substituted for a number of fixed master ring gages. The master is set by means of gage blocks to any desired dimension between 1" and 12⅛". The swivelling column locks in either of two positions. When setting the master to gage blocks, proper pressure is assured by a ratchet drive. The setting of the bore gage is facilitated by a guide cap. Standard Gage Co., Inc., Poughkeepsie, N. Y., or — **Circle No. A16.**

DRILL MICRO-HOLES
DOWN TO .0016"
with SPEED & ACCURACY

ON LEVIN® INSTRUMENT LATHES



The Levin micro-drilling equipment shown here can be used with the smallest drills available. It is designed so that the drilling does not depend on the operator's sense of feel. The drill can be retracted for chip removal and returned to the drilling position without striking the bottom of the hole. While commercial drills can be had as small as .0016" this micro-drilling apparatus has successfully produced holes as small as .0006".

Send for Catalog M describing complete line of instrument lathes and accessories.

LOUIS LEVIN & SON, INC.—3610 S. BROADWAY—LOS ANGELES 7, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1771

Heads...You Win!

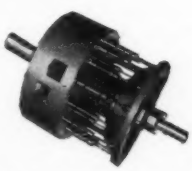
U. S. DRILL HEADS, THAT IS!

For automatic setup.

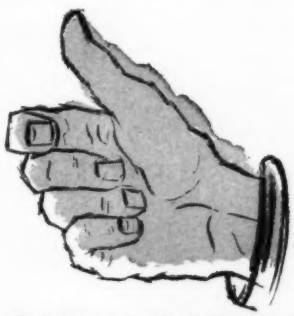
Regardless of the size of your shop, if you have high production jobs, you'll find an extraordinary reduction in tooling and manufacturing costs when you use U. S. Drill Heads.

The heads shown here, moderate in cost, are for use with automatic chucking machines and turret lathes, for drilling or tapping operations. They provide, in most cases, that a part can be completely finished in one handling.

For semi-automatic setup.



For semi-automatic setup.



Manufacturers of all types of adjustable, fixed center and individual lead screw tapping heads.

US DRILL HEAD — THE UNITED STATES DRILL HEAD COMPANY
BURNS STREET • CINCINNATI 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1772

(Actual Size)

After consultation with our engineering staff and with the use of dies from our tremendous library maintained specifically to save our customers time and money, this part illustrated actually saved one manufacturer 94% of usual production costs!

Price breakdown was as follows:

Tools	$41.00
Labor	.059
Material	.0021

SAVED— $681.00 or 94%

LOW die cost
FAST delivery
- Blanking
- Forming
- Piercing
- Drawing
- Extruding
- Stenciling
- Tapping
- Countersinking
- Plating
- Machining
- Painting
- Grinding
- Welding

Yes, WLS SPEEDTOOLING for small quantity stamping needs is a saver every time! A radical production advancement, it eliminates most of the cost required for permanent dies. Finished parts are produced to tolerances as close as those from tools costing ten times as much. When jobs are completed WLS SPEEDTOOLING is stored for future use.

Use WLS for production quantities up to 100,000 when low cost, fast delivery, possible design changes for virtually nothing, are important factors!

FREE
1. Write now for a free sample part with a cost summary.
2. Our free bulletin also illustrates 40 small stampings.
3. Send in your blueprints to our engineering department for a prompt quotation.

WLS STAMPING COMPANY
3283 E. 80th Street • Cleveland 4, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1773

For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., U. S. 12, PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

CIRCLE INFORM-A-GRAM KEY NO. 1781

HAND KNOBS

6 SIZES
CAST IRON

Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

Write for catalog

TIETZMANN TOOL CORPORATION
Dept. HK-2 • Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1782

METAL PRODUCTION CAPACITY AVAILABLE

For long or short production runs of large or small parts, tools, jigs or fixtures. Also dies, gages, special machinery.

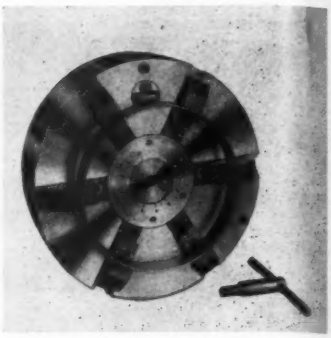
KELLER PROFILOMETER-DUPLICATOR, 16" x 24"
PRESSES UP TO 450-TON, 48" x 48", TRIPLE ACTION
PLANERS UP TO 20-FOOT STROKE, 72" x 72"
RADIAL DRILL PRESSES UP TO 8-FOOT, 19" COLUMN
LATHES UP TO 158" c.c., 57½" gap, 40" SWING
BORING MILLS UP TO 120" BED, 90" HORIZ., 60" VERT.

Also Milling Machines, Grinders, etc. Complete production facilities — experienced machinists.

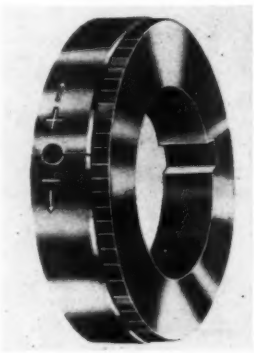
Inquiries Invited on Contract Basis or Individual Quotation

PIVOT PUNCH & DIE CORPORATION
NORTH TONAWANDA, N. Y. Phone JA. 1200

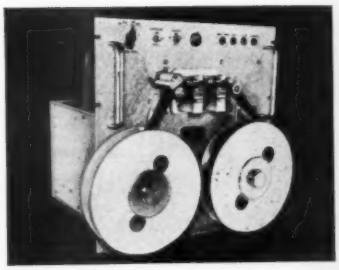
CIRCLE INFORM-A-GRAM KEY NO. 1783



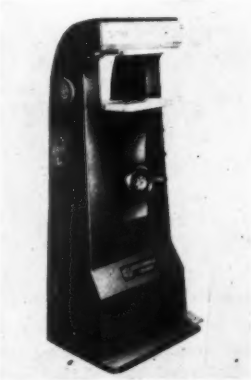
Controlled Centering Pressure is a feature of this 6-jaw universal chuck. The workpiece is centered accurately and rapidly without danger of distortion due to overtightening by the operator. The chuck is manufactured in 12", 15", 18", 21", and 24" dia for any type of spindle mounting. Horton Chuck, Div'n of the E. Horton & Son Co., Windsor Locks, Conn., or — **Circle Inform-A-Gram No. A17.**



Fast, Accurate Spacing of multiple setups on production milling machines and similar equipment is made easy by a new micrometer adjustable spacing collar. The Milling "Mike" is calibrated in thousandths of an inch. Positive adjustments to split thousandths can be made visually. The collar is available in 6 cutter arbor sizes — ⅞", 1", 1¼", 1½", 1¾", and 2". Dayton Rogers Mfg. Co., 282 — 13th Ave. S., Minneapolis 7, or — **Circle No. A18.**



Two New Tape Transports are available for reel sizes to 10½", tape widths from ¼" to 2" in ¼" increments, and a wide choice of tape speeds. Type 103 (shown) uses one or two single, dual, or triple speed hysteresis synchronous motors to drive the capstan at any one of up to 6 different speeds and Type 102 transport uses one single or multiple speed motor. Details are in Bulletins 3153 and 3154 from Davies Laboratories, Inc., 4705 Queensbury Rd., Riverdale, Md., or — **Circle No. A19.**



Normal Marking Operations requiring up to 8000 lbs pressure, with a maximum lettering length of 3½" are performed by a new hydraulic marking machine. Model 365 is smaller and lighter than Model 175. Its production rate is 800 to 1000 parts/hr. The marking capacity is 4 lines of 1/16" characters; 3 lines of 3/32" or ⅛" characters; and 2 lines of ¼" characters. Geo. T. Schmidt, Inc., 4112 Ravenswood Ave., Chicago 13, or — **Circle No. A20.**

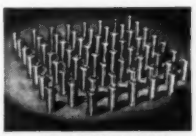
SOUTH BEND LATHE ATTACHMENTS

- Increase Lathe Versatility
- Simplify Difficult Jobs
- Perform Special Classes of Work

Handlever Collet Attachment

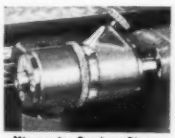
Telescopic Taper Attachment

Adjustable Collet Bushing Chuck


Steel and Brass Collets

Safety and Standard Lathe Dogs

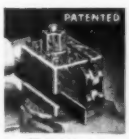
Telescoping Jaw Follower Rest and Center Rest


Micrometer Carriage Stop

Handwheel Collet Attachment

Milling Attachment

Ball Bearing Live Center



10 in 1 Tool Holder

Thread Dial Indicator

External Grinder

Centers, Drill Pads

Write for Catalog 5600
SOUTH BEND LATHE
Building Better Tools Since 1906
South Bend 22, Indiana

CIRCLE INFORM-A-GRAM KEY NO. 1791

Catch Production Flaws Before They Become COSTLY!

Many modern plants today use Industrial Magnifiers to aid in assembling and inspection of their products. The results . . . a product that meets specifications—maintenance of a quality reputation—highest possible production efficiency. Have you considered the importance of Industrial Magnifiers in regards to your plant?

FREE! Write today for tell-all booklet and catalog, "INDUSTRIAL MAGNIFIERS, HOW TO CHOOSE AND USE THEM," Bausch & Lomb Optical Co., 50406 Bausch St., Rochester 2, N. Y.

BAUSCH & LOMB
SINCE 1853

CIRCLE INFORM-A-GRAM KEY NO. 1792

AQ* ------CUTS SHORT RUN STAMPING COSTS--------

PROBLEM:

Relay Support Bracket with
9 holes—two different sizes
Tolerance—hole dia. + .002/— .001; location ± .003
Blank size (developed)—1¼" x 3"
Material—.062 C. R. Strip Steel

RELAY BRACKET HOLE PUNCHING ANALYSIS

CONVENTIONAL	Single Hole "Short Run" jig punching Tools and first 1,000 pieces Subsequent re-runs 1,000 pieces	$125.00 $102.00
CONVENTIONAL	"Permanent Gang Die" Punching Tools and first 1,000 pieces Subsequent re-runs 1,000 pieces	$266.00 $11.00
FEDERAL	"Multiple Hole Process" Punching Tools and first 1,000 pieces Subsequent re-runs 1,000 pieces	$70.00 $41.00

In analyzing the problem it was found that only through Federal's multiple hole-punching process could stamping costs be cut and still hold to rigid tolerances. Let Federal quote on your next *problem piece* and save!

Send your print, sketch or piece for our . . .

*Analyzed Quotation

Federal TOOL & MFG. CO.
Quality Stampings in Small Quantities
3614 Alabama Ave., Minneapolis 16, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1793

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

* A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

Model "D"

WRITE for COMPLETE DETAILS

CHANDLER TOOL CO. Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

CIRCLE INFORM-A-GARM KEY NO. 1801

Cut Costs!

with the NEW YOST DRILL PRESS VISE

- Developed expressly for use on drill press operations.
- Does away with special and costly jig fixtures.
- Available in two sizes:

No.	Jaw Width	Max. Opening
1D	3½"	4 "
2D	5 "	5½"

Write today for bulletin on the extensive Yost line.

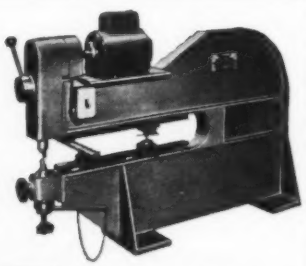
YOST MFG. CO. 124 Grant St., Cambridge Springs, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1802

CUT FASTER ... CLEANER

No FINISHING necessary if you cut slots, louvers, circles and do beading, folding and other metal working with the —

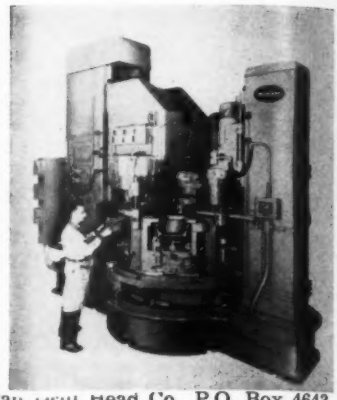
NORDEX



Nordl Corporation
20 SPRUCE STREET
NUTLEY, NEW JERSEY

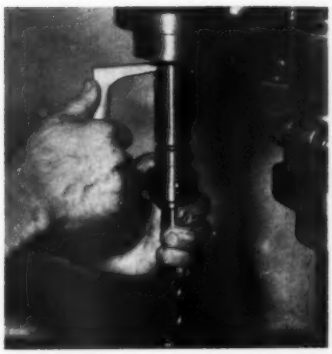
Write for new illustrated literature and prices. See how you can do dozens of difficult cutting jobs on one machine that's always ready for use, saving time and money.

CIRCLE INFORM-A-GRAM KEY NO. 1803



Drill, Chamfer, rough and finish bore the starter hole; ream 2 dowel holes; spot face 4 inside bosses; and tap 5 holes in a V-8 clutch housing with this production giant machine. It is designed to complete 120 clutch housings/hr, and with a few tool changes, it handles 2 models on the same machine. The machine features 6 work stations. Michigan Drill Head Co., P.O. Box 4643, Detroit 34, or — **Circle Inform-A-Gram No. A21.**

Chamfer a Tapped Hole while tapping by using the Burr-Bit. The Burr-Bit device which is slipped over the tap, operates while the tap is being withdrawn and can be used on all materials. It will fit all 2 and 4 fluted taps from No. 2 to 5/16" in all pitches. Vernon Devices Inc., 8 Wilson Pl., Mt. Vernon, N. Y., or — **Circle No. A22.**



Eliminate Damage to Machine Spindles and Bearings caused by hammering on other tool removing devices, with a new cam-type tool ejector. The Scully-Drift can be used with one hand, allowing the operator to maintain complete control of the tool with the other. The ejector is available in sizes for Nos. 2 and 3 Morse taper spindles. Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or — **Circle Inform-A-Gram No. A23.**

Cut Bare and Insulated Wire, spaghetti tubing, plastic tubing, etc. with a new automatic cut-off machine. The "Electrocut" can handle materials up to ⅜" dia. It can be adjusted to cut lengths from ¾" up to 13". The standard model provides repeat accuracy of ±1/32". The machine draws the material directly from the spool and automatically cuts until the spool is empty. Black & Webster, Inc., 445 Watertown St., Newton 58, Mass., or — **Circle No. A24.**

CYCLONE SEPARATION

FOR MORE EFFICIENT DUST COLLECTION —FILTERS LAST LONGER

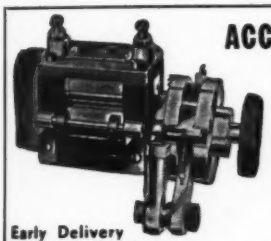
Almost all industrial dusts can be collected more efficiently by Dustkop. Thirty-seven standard models *ready to use!* Reduce installation costs — save space. Write for descriptive literature.

ALSO A COMPLETE LINE OF MIST COLLECTORS

DUSTKOP® STOPS DUST

AGET MANUFACTURING COMPANY
1394 EAST CHURCH ST., ADRIAN, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1811



ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO 12" WIDE

Early Delivery on Standard Models

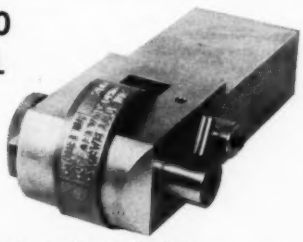
Write for descriptive literature

"RFC" ROLL FEEDS are quality built for long, dependable service.

ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electrix Affiliate

CIRCLE INFORM-A-GRAM KEY NO. 1812

***New* Series 1500**
ROLL MARKING TOOL
PRECISION BUILT



- Trouble-free operation.
- Master roll die has recess for interchangeable part numbers, trade or code marks.
- Easily attached to automatics, turret lathes, hand screw machines.
- Other models available for special marking applications.

MARKALL offers prompt service on roll, hand and press marking dies, type and type holders, and embossing dies. Precision machine graduating and engraving services also available.

Send for free literature — Inquiries invited.

MARKALL PRODUCTS CO. 27100 Knickerbocker Road Bay Village, Ohio (Cleveland)

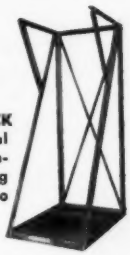
CIRCLE INFORM-A-GRAM KEY NO. 1813

NEW IDEAS

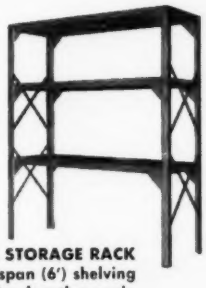
TO DOUBLE YOUR STORAGE CAPACITY

Time- and space-saving equipment of advance design . . . permits new economy, efficiency and handling ease . . . for every storage operation.

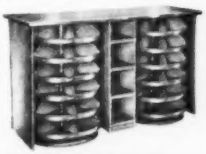
WAREHOUSE RACK
For storage of heaviest palletized loads — up to 4000 lbs. per shelf! No. WR-9



CONDUIT RACK
Permits vertical storage of conduit and tubing in lengths up to 10'.
No. ECR



BULK STORAGE RACK
Long-span (6') shelving handles lengthy packages or bulk loads.
No. BSR-247

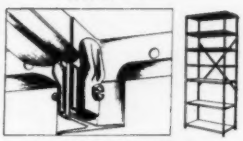


ROTABIN COUNTER
Permits finger-tip accessibility of many fast-moving small items. No. C-286-27-S

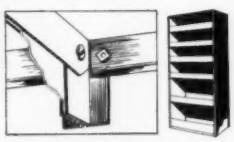
SERVICE CART
For moving small items quickly, safely in plant operation. No. SC-30

PALLET FRAME
Permits fast pallet stacking of irregular or crushable loads.
No. PF-44

ROTABINS
For broken package lots or large quantities of small items.



KLIP-BILT SHELVING
Installation is fast without tools . . . using simple clips.



ANGLE TYPE SHELVING
Offers a wide range of standard sizes, parts and accessories.

The FRICK-GALLAGHER MANUFACTURING CO.
WELLSTON, OHIO

Specialists in Storage Planning and Manufacturing of Storage Equipment

TELL ME MORE ABOUT STORAGE ECONOMY . . .
The FRICK-GALLAGHER MFG. CO.
106 So. Michigan Avenue, Wellston, Ohio

Please send me catalogs checked.

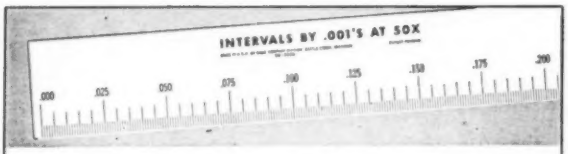
☐ Miscellaneous Equipment (Cat. No. 702)
☐ Klip-Bilt Shelving (Cat. No. 703)
☐ Rotabins (Cat. No. 110-A)
☐ Angle Type Shelving (Cat. No. 550)

Name_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1814

CIRCLE INFORM-A-GRAM KEY NO. 1803

Mass., or — **Circle No. A24.**



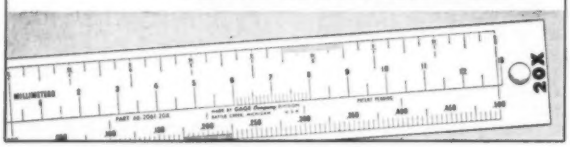
Gage Company PRECISION PLASTIC
COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

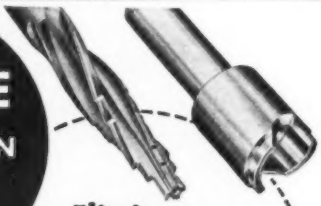
WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY
BATTLE CREEK, MICHIGAN

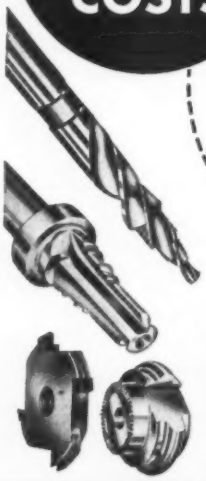


CIRCLE INFORM-A-GRAM KEY NO. 1821

REDUCE PRODUCTION COSTS



Eliminate Extra Operations —Use Spiral's "Multiple-Operation" Step Tools

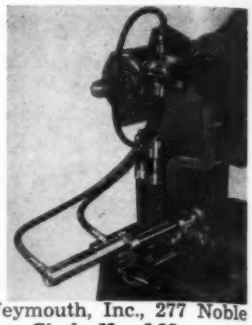


Carbide and High Speed

Step drills, step reamers, milling cutters, seating and grooving tools, trepanning tools, form tools, carbide and high speed, made to your specs or designed by our engineers to fit your needs. Form ground with "radial relief" gives up to 500% more tool life, imparts smoother finishes on piece parts. Send for details.

SPIRAL STEP TOOL COMPANY
Designers and Manufacturers of All Types of Special Cutting Tools
5400 N. Damen Avenue • Chicago 25, Illinois
Phone: LOngbeach 1-5384

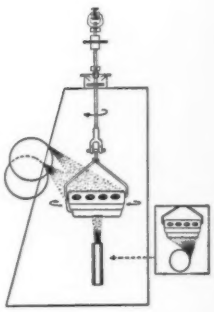
CIRCLE INFORM-A-GRAM KEY NO. 1822



Fast, Automatic Feeding on small punch presses is performed by a smaller air-operated slide feed. It can be easily moved from press to press or can be left mounted on die sets. This feed is not a spring-fed feed and no cam cut-outs are necessary. This pneumatic slide feed takes material up to a maximum thickness of 1/16" to 6" widths in lighter gauges with a maximum feed length of 3". Cooper Weymouth, Inc., 277 Noble Ave., Bridgeport 8, Conn., or — **Circle No. A25.**

Heavy Tapping on small drill presses is possible when using the Ettco-Emrick No. 3-B tapping attachment. Maximum tapping and threading capacity is ½" in steel. The attachment incorporates a planetary gear arrangement which reduces tap speed to 1/3 the drill spindle speed. The attachment can be fitted to any drill press. Full information is in Bulletin 22A supplied by Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, or — **Circle No. A26.**

Parts with Internal Open Cavities that are difficult to clean completely are handled by the new UB monorail-type blast cleaner. This machine is an airless abrasive blast cleaner which makes more efficient use of the blast cleaning abrasive, resulting in lower cleaning cost per part. Wheelabrator Corp., Mishawaka, Ind., or— **Circle No. A27.**



This Heavy-Duty Conveyor equipped with a heavy-duty wire mesh belt is designed for handling heavy loads. It will handle hot forgings, heavy objects with slick surfaces, and heavy, awkward - shaped objects. The conveyor can be rolled from job to job or used in stationary locations. Cooney Industries, Inc., 17245 E. 10 Mile Rd., East Detroit, Mich., or — **Circle No. A28.**

MARKALL PRODUCTS CO. 27100 Knickerbocker Road Bay Village, Ohio (Cleveland)

CIRCLE INFORM-A-GRAM KEY NO. 1813

CIRCLE INFORM-A-GRAM KEY NO. 1814

JACO LOW COST AUTOMATIC

STOCK REEL

COSTS NO MORE THAN STANDARD STOCK REELS

POWERED BY THE NATURAL SPRING OF UNCOILING STOCK

3 SIZES – ALL WILL TAKE 6" WIDE STOCK.

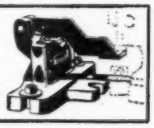
24" diameter $85.00

30" diameter $89.00

36" diameter $95.00

Guaranteed – money back if not 100% satisfied

New LOW prices on the JACO 3-inch and 6-inch SCRAP CHOPPER



WRITE FOR FULL DETAILS TODAY!

Dealer Inquiries Invited

JACO DEVICES, INC.

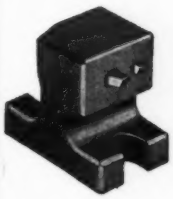
96 High Street Hingham, Mass.

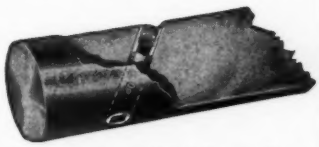
CIRCLE INFORM-A-GRAM KEY NO. 1831

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!

Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.





The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH RD., DETROIT 19, MICH.

Write for Literature

CIRCLE INFORM-A-GRAM KEY NO. 1833

MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
⅞	1-9/16	$11.50
1	1-13/16	11.50
1¼	2-1/16	12.25
1½	2-7/16	12.25
1¾	2-3/4	14.50
2	3-1/16	16.50

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7 B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1832

SERVICE GARMENTS

Shopcoats – Coveralls

Matched Shirts and Pants

Shop Caps

LADIES' UNIFORMS

Lettering and Emblems

Catalog on request

Commercial & Industrial Uniform Co.
527 W. Roosevelt Road, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1834

Now Available in "SPRAY ON" CANS and in "BULK"

CROWN design layout ink

Just Press the Trigger on the Can

Order it the way you use it most—in handy Aerosol spray can or in pints, quarts, gallons or barrels in bulk. No waste, no mess, no stained hands—Crown ink dries to an excellent scribing texture in a minute. Also ideal for "OK" or "reject" inspection marking.

only $1.59 per 12 oz. can

Order from distributor or mail coupon

CROWN INDUSTRIAL PRODUCTS CO.
808 Amsterdam St., Woodstock, Ill.

Gentlemen: Kindly send us complete information on Crown Design Layout Ink and name of nearest distributor.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1835

NUMBERALL
CUTS THE COST OF STAMPING NUMBERS!

AUTOMATIC INDENTING NUMBERING HEAD - MODEL 50

Automatic indenting numbering head for consecutive or repeat numbering. 1/32" up to 3/8" high figures can be furnished in sharp face Gothic or shaded Roman figures. Can be used in foot or power presses. Numbers: radio, airplane, tool parts, name plates, and other objects in brass, steel, fiber, plastics. Heads are of sturdy construction and give uninterrupted marking service. Catalog TP-50 on request.

Prompt delivery of most sizes.

Specialities in making devices for stamping details into Nameplates, such as Automatic and Non-Automatic Numbering Machines, Type and Type Holders, and Chases, etc.: also Presses

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1841

EXPAND YOUR FACILITIES
with STANDARD TOOL "Know-how"
— your need for special automatic production machinery can be met

Today

Unparalled facilities for Contract Machine Work and Design, Fabrication or Development of Special Automatic Equipment at—

Write for your copy today— without obligation

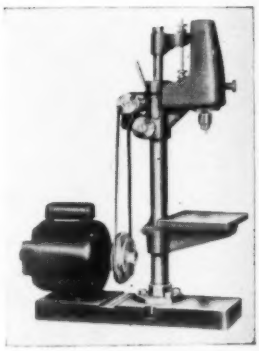
STANDARD TOOL & MANUFACTURING CO.
230 LAUREL AVE. • ARLINGTON, NEW JERSEY

CIRCLE INFORM-A-GRAM KEY NO. 1842

A Telescoping Feature that adjusts up and down to fit a wide range of work is incorporated into a new hold-down clamp. The QK Clamp will do the work of four without using a large variety of T-bolt lengths for the varying work heights. One end is of conventional design and the other is a special design to fit into small slots and recesses. The clamp is available in 6 sizes. Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, or — **Circle Inform-A-Gram No. A29.**

Automate a Wide Variety of Machine Operations or sequence of operations with this 9-point mechanical rotary limit switch developed by E. W. Bliss Co., Canton 10. Each of the control stations can be independently set through the complete range of 0 to 360°. A 4-station unit is also available. **Circle No. A30.**

Drill to the Center of a 6" Circle with this new drill. Class 8 sensitive drilling machine has a 9/16" dia spindle with a spindle feed of 2¼". The drill's capacity is No. 80 to ¼" drills. It is available with 2 drives. High Speed Hammer Co., Inc., 313 Norton St., Rochester 5, N. Y., or — **Circle No. A31.**



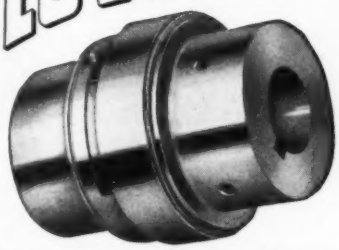
Designed for Gaging the Thickness of metal sheets and plates is a new deep throat micrometer. It permits measurement up to 3¼" from the edge of the work. It is available with a range to 1" x 0.001". The Lufkin Rule Co., Saginaw, Mich., or—**Circle No. A32.**

A Holding Device for drilling, tapping, milling, threading, reaming, etc. is the "Quick-Lok" collet vise. It is universally adaptable to drill presses, milling machines, and surface grinders. The No. 3 Series has a capacity of up to ½" rounds and the No. 5 Series, a maximum capacity up to 1" rounds. Arrow Machinists, 17 N. West St., Mt. Vernon, N. Y., or — **Circle Inform-A-Gram No. A33.**

15 YEARS SERVICE WITH ONE SET OF CUSHIONS

... actual report on

LOVEJOY



Flexible Couplings

Up to fifteen years maintenance-free service is not unusual with Lovejoy lubrication-free flexible couplings.

Performance like this is practical proof of these soundly engineered features:

SIMPLE, RUGGED CONSTRUCTION
Fewer parts. No intricate mechanisms. Nothing to lubricate.

LOAD TRANSMITTED BY CUSHION COMPRESSION
No wear on the metal jaws.

DOUBLE-LIFE CUSHIONS
One half of the cushions act as idlers—except on reversible loads. A quick interchange provides a new set of cushions. This can be done without dismantling the coupling.

Illustration at right shows a Lovejoy Type CF flange-mounted coupling. Rated at 160 hp., 800 rpm., this space saver connects drive shaft between diesel power unit and generator.

You can get Lovejoy performance for your application.

Let us know your requirements or request complete-line catalog.

LOVEJOY FLEXIBLE COUPLING CO.

4819 W. LAKE STREET • CHICAGO 44, ILL.

Mfrs. of Flexible Couplings, Variable Speed Pulleys and Transmissions, Motor Bases and Universal Joints.

CIRCLE INFORM-A-GRAM KEY NO. 1851

LUCAS TOTE PANS

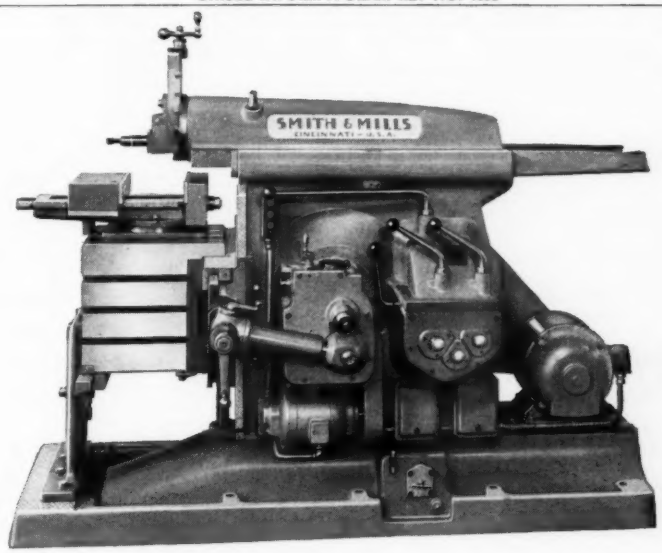
HELP SOLVE PRODUCTION PROBLEMS!

Lucas Tote Pans are built for long wear and ease of handling. Designed for every shop use—storing materials, holding parts for convenient handling by machine operators and at assembly lines, Lucas Tote Pans are available in nesting type, stacking type, straight side and assembly or bench pans. Lengths from 10" to 32", widths from 5" to 23" in standard sizes. Other sizes made to your specifications.

For Further Information, Write

J. L. LUCAS & SON, INC. Bridgeport 5P, Conn. Tel. CLearwater 9-3393

CIRCLE INFORM-A-GRAM KEY NO. 1852



SMITH & MILLS SHAPERS—

for production and tool room

Compare Smith & Mills with any other shaper for versatility, speed, cutting power and precision performance. *Compare* and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service. Smith & Mills Shaper Division, Nebel Machine Tool Corp., 3401 Central Parkway, Cincinnati 25, Ohio.

Smith & Mills Shapers now available in Heavy Duty Models in 16", 20", 25", 28", 32" and 36" strokes, and Standard Duty Models in 20" and 24" strokes.

Smith AND Mills SHAPERS CINCINNATI

CIRCLE INFORM-A-GRAM KEY NO. 1853

IT'S Economy ALL THE WAY!

— when you order your duplication requirements for these Standard Items . . .

A. G. D. PLUG & RING GAGES

"TRU-LOC"
Adjustable Adapter Sleeves and Nuts

A. S. A. DRILL BUSHINGS

"Economy" stocks always complete to assure immediate delivery. Worn-out plugs and ring gages salvaged at low cost.

Ask about the new "Economy" Extended O.D. Symbol Range. Dimensional Data Sheet No. 7-A Upon Request.

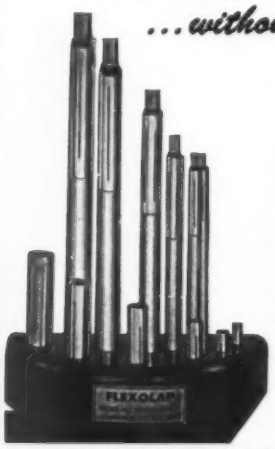
ECONOMY TOOL & MACHINE CO. 1828 SOUTH 68th STREET MILWAUKEE 14, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1861

Flexolap . . . INSTANTLY AND ACCURATELY

ADJUSTABLE FOR FAST CUTTING AND POLISHING

. . . without danger of galling or seizing!



The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15%—or more—under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.

Illustrated at left is Flexolap Set No. 1. Includes 6 complete laps, one of each size (3/16", ¼", 5/16", ⅜", 7/16" and ½"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

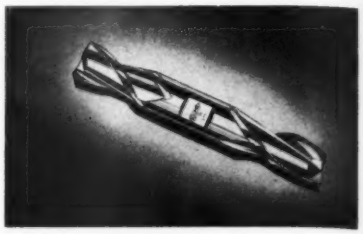
Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

Write today for Catalog

FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1862

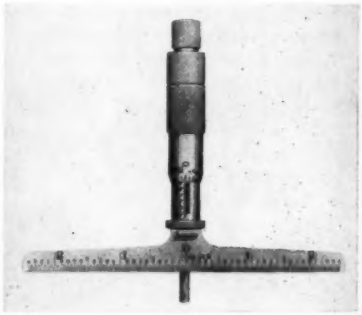
End Mills ground from the solid are now available from Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20. These end mills insure superior performance affording long-



er life, finer finishes, and lower production costs. The company has perfected the shape of flutes in regard to width, depth, curve of hook, and form relief. **Circle No. A34.**

Speed Production of Complex Contours with a hydraulic shaper that is template controlled. Such parts as splines, contoured punches, externally contoured sections, metal removing electrodes or punches, and short-run contoured pieces are made quickly and accurately. The template is normally the same size as the work, but can be larger than the work if desired. Haller, Inc., Plymouth, Mich., or — **Circle No. A35.**

Measure the Depth of Holes, slots, projections, etc. with micrometer accuracy with a new micrometer depth gage. The base is graduated on one side to permit taking measurements at a specified distance from the edge of the work. The depth



gage is available in ranges of 3" and 6". The Lufkin Rule Co., Saginaw, Mich., or — **Circle No. A36.**

A Precision Fitted Hinge with less than 0.0001" clearance between fitted parts is a feature of a sine plate introduced by Karniotis Precision Products, Inc., 14847 Heyden Ave., Detroit 23. The sine rolls which are not held by screws, are jig ground spaced holes with rolls fitted to the hole size, one becoming the hinge pin and the other the sine roll. The sine plate opens square and parallel within 0.00005" at any point. **Circle Inform-A-Gram No. A37.**

MAYLINE

MAYLINE
Metal Plan Files are Outstanding

For their construction, usefulness, and appearance. Heavy gauge steel used throughout. Extra reinforcing on corners and bases. Drawers have finger-tip control. Hinged dust cover keeps drawings flat and dust free. Cabinets attractively finished in modern office gray.

See your local dealer today for prices and delivery.

MAYLINE MAYLINE

MAYLINE

Symbol of Superiority

MAYLINE CO.

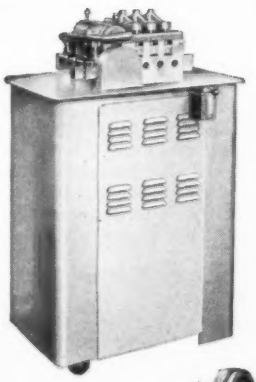
635 NO. COMMERCE ST.
SHEBOYGAN, WISCONSIN

MAYLINE

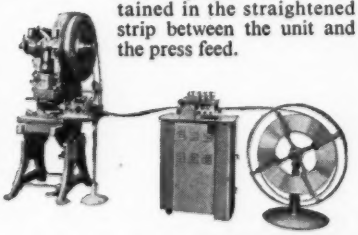
CIRCLE INFORM-A-GRAM KEY NO. 1871

Economy • Dependability

WITTEK
STOCK STRAIGHTENERS



Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars
WITTEK Manufacturing Co.
4323 W. 24th Place • Chicago 23, Illinois

5577
Production Feeding Equipment

CIRCLE INFORM-A-GRAM KEY NO. 1872

Tough grinding jobs?
Check Vulcanaire high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

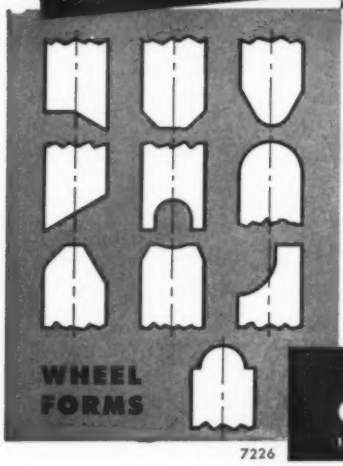
Major Vulcan Services

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.
741 LORAIN AVE. • DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1873

Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME



The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

Write for Descriptive Bulletin

PERFEX

PERFEX GAGE & TOOL CO.
123 AVERY ST. • MT. CLEMENS, MICH.

7226

CIRCLE INFORM-A-GRAM KEY NO. 1881

HARDENED and GROUND HSS BLANKS

Any decimal diameter to 5/8"—in any length.
Mirror finish surface to gage tolerance.
Many uses—
—core pins, punches, gages, ejector pins, insert pins, special tools, etc.—Quick delivery.

Write or phone Millburn 6-4222 for price list D-3

WILLIAM T. HUTCHINSON CO.
P.O.B. 328, UNION, N. J.
Factory: Springfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1882

JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
21 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

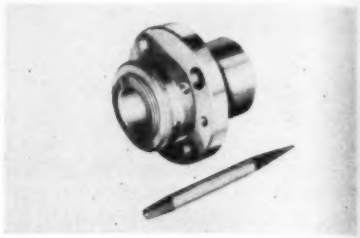
CIRCLE INFORM-A-GRAM KEY NO. 1883

HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1884

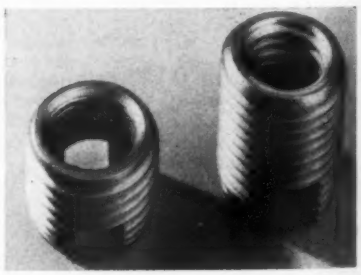
A New Line of "Better-Hold" chucks for use with shank-type cutting tools has been developed by Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8. These chucks can apply a powerful, accurate centering fit to tools by twisting the



threaded lock-and-eject nut. This firm grip on the cutting tool shank eliminates any danger of the tool being pulled out of the chuck. The chucks feature rapid tool changes. Complete specification and size information can be obtained from the company. **Circle No. A38.**

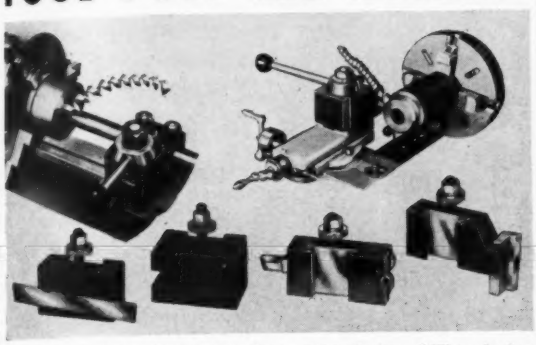
Reduce Costs in many types of mass assembly with Model 400 power screwdriver. It can be operator-controlled for certain work and then converted to fully automatic operation when needed. The Shakeproof power screwdriver can drive as many as 60 screws/min. In addition, it reduces scrap loss and product damage and is adaptable to many unusual operations. For an illustrated booklet, write to Shakeproof Div'n, Illinois Tool Works, Power Screwdriver Dept., 2501 N. Keeler Ave., Chicago 39, or — **Circle No. A39.**

A New Short Series Tap-Lok Insert has been developed for thin boss materials. Like the Regular Series, this Series is used where thread wear conditions exist due to excessive assembly and disassembly in soft material such as aluminum, magnesium, and plastics, and where critical



tensile stress conditions are found. These inserts which are available in steel, stainless steel, and brass, also work in slightly harder alloy materials of magnesium and aluminum. Groov-Pin Corp., Ridgefield, N. J., or **Circle Inform-A-Gram No. A40.**

GET THE MAXIMUM
from your lathes by using the
ALORIS "Quick Change"
patented
TOOL POST and HOLDERS



Only a second to change tools for turning, facing, drilling, boring, threading, knurling, cutting off or any other operation.

- Great Repetitive Accuracy
- Rugged Construction
- Tested and Recommended by Leading Lathe Manufacturers
- Greater Rigidity
- Saves 90% in Set-Up Time
- Unconditionally Guaranteed

Write for catalog and price list.

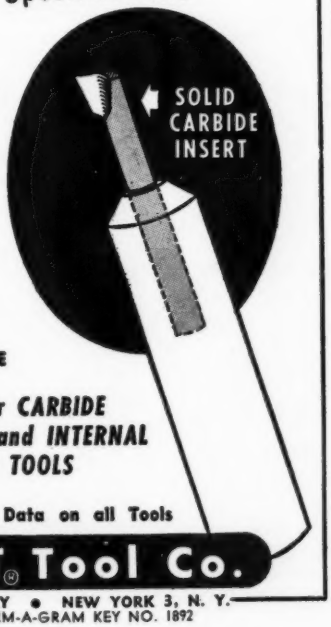
ALORIS TOOL CO., INC. 131-37 SANFORD AVENUE FLUSHING 55, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1891

COMET® offers SOLID CARBIDE INSERT BORING TOOLS
Made to Your Specifications

FOR UTMOST PRECISION AND RIGIDITY, USE COMET® BORING TOOLS WITH SOLID CARBIDE INSERTS SET INTO STEEL SHANKS

SIZES FOR HOLES FROM 1/16" UPWARD



ALSO AVAILABLE

HIGH SPEED or CARBIDE BORING, FACING and INTERNAL THREADING TOOLS

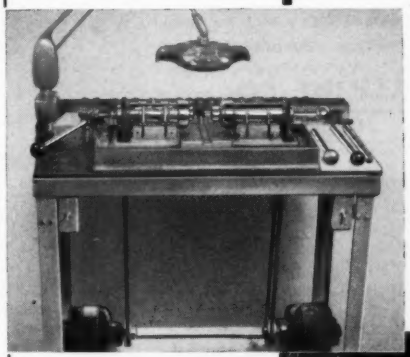
Write for Complete Data on all Tools

COMET® Tool Co.

738-T BROADWAY • NEW YORK 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1892

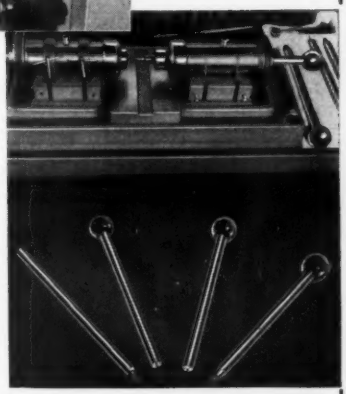
NOW POSSIBLE!
CONSECUTIVE OPERATIONS WITH MULTIPLE TOOLING -
Without removing workpiece from work spindle



JEDCO MICRO-DRILLING MACHINE
★

For Drilling Holes Parallel To A Cylindrical Axis

At last . . . a micro drilling machine with MULTIPLE TOOL QUILLS . . . allowing a series of operations — drilling, chamfering, reaming, etc. — to be done consecutively without need of removing workpiece from work spindle.



OR . . . with suitable attachments, another model can be used to drill holes on rectangular coordinates to an accuracy of plus or minus .0005.

CONTACT US FOR YOUR PROBLEMS . . .

In small tools, minute drilling operations, Micro Drill Guides, automation engineering and building facilities.

MICRO DRILL GUIDE
DIVISION JEDCO INC.
3980 SUPERIOR AVENUE CINCINNATI 36, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1893

You Can Rely on a ROUSSELLE

THESE 40-TON PRESSES

take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Significant savings may result if you let our engineering staff assist you. There is no obligation.

•

Rousselle Presses are sold exclusively through leading machinery dealers.

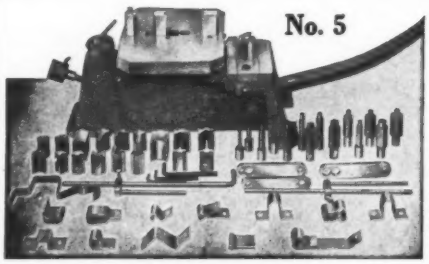
•

Choice of 25 models in 5 to 40-ton sizes.

Manufacturers of Rousselle Presses

SERVICE MACHINE CO. 2310 West 78th Street • Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1901



WRITE FOR DESCRIPTIVE CIRCULAR

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

ALSO AIR OPERATED MODELS

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1902

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

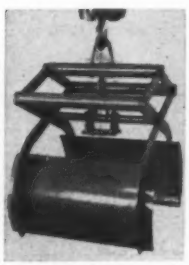
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY

2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1903



LIFTING DEVICES

for

FAST • SAFE • BETTER Material Handling of

• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS

400 MODELS

Prompt Delivery
Write for full particulars

H. L. BUSHMAN CO. 100 W. Central Ave. Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1904

CAMS

To Your Specifications

• • • • •

— Except Screw Machine Cams —

• • • • •

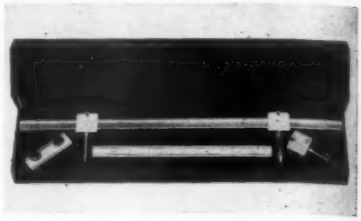
Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION

10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1905

The Era Famous Beam Compass is featured in an enlarged set to which has been added a coupling and pen slide. The coupling eliminates the need for extra length beams which have to be purchased individually.

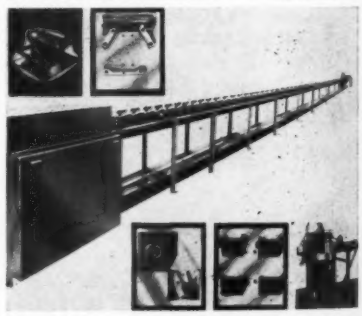


The compass is a precision tool used by draftsmen and designers. Engineering Research Associates, Inc., 3475 E. Nine Mile Rd., Hazel Park, Mich., or — **Circle No. A41.**

Accurately Sharpen Circular Form Tools without using complicated fixtures with the aid of a new gage. The gage is designed for fast, accurate sharpening on offhand and machine grinding methods. The gage attaches to all circular form tools,

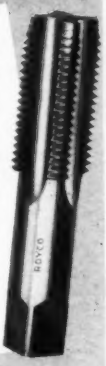
threaded or non-threaded, and indicates the correct cutting angle automatically. The standard model provides 0°, 5°, and 10° top rake angle. Sperco Tool Co., Dept. F-42, 2318 St. Clair Ave., Cleveland 14, or — **Circle Inform-A-Gram No. A42.**

Assembly, Inspection, and Other Processing are handled by a new expandable platen conveyor. The Conveymatic conveyor is available in lengths up to 100 ft, in interchangeable 10 ft sections. It features a



continuous variable speed range from 100 ft to 300 ft/hr. Many other standard and optional features are available. For literature on the Conveymatic, contact Visi-Trol Engineering Co., 9345 Hubbell, Detroit 28, or — **Circle Inform-A-Gram No. A43.**

TAPPING TROUBLES?



Royco Precision Ground Taps are engineered for your particular job.

Royco Taps are ground entirely between centers using precise machines and tooling. High quality is not sacrificed for mass production methods.

If you have parts that require ground threads, Royco offers fast service at the right price.

Send for Catalog TODAY

Royco *Service Will Save You Money*

Royco Tap & Tool Corp.
PHONE 2210
BOX 268B NORTH BRANCH, MICH.

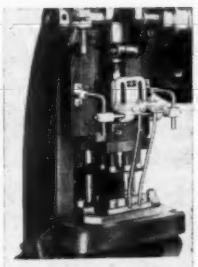
CIRCLE INFORM-A-GRAM KEY NO. 1911

economically priced press room equipment

DURANT
Sweep Guard

A positive safety guard on power presses. Rugged. Needle bearings assure long life. List price from $58.00.

Manufacturers of Stock Reels, Roll Feeds, Straighteners, Scrap Choppers, Die Pullers, Foot Presses, Coil Cradles, Press Guards, Stock Oilers.



WRITE FOR NEW FREE CATALOG

DURANT Tool Supply Co.
PROVIDENCE 3, RHODE ISLAND

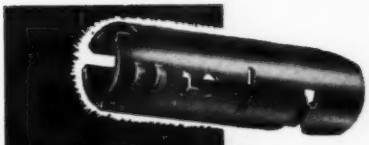
CIRCLE INFORM-A-GRAM KEY NO. 1912

NEW TECHNIQUES *in* CUTTING & DRAWING

Write for data on the remarkable Kelkut 202 EP Soluble Concentrate . . . it greatly improves drawing, cutting, broaching, drilling, milling and grinding operations . . . often replaces high-priced sulphurized or Heavy Duty oils . . . reduces oil ratios and coolant costs. Write to . . .

ALDRIDGE INDUSTRIAL OILS, Inc.
3401 W. 140th St., Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1913



12¢ or 4¢ to make this metal part?

This is a door handle tube, but it might be any of a hundred metal components or products. A big lock manufacturer was making it in his own plant at a cost of 12¢—until A. K. Tool, specialists in metal parts fabrication, undertook to turn it out for him for just 4¢.

Many of the nation's foremost manufacturers have found it cheaper, simpler to leave fabrication of their metal components to A. K. Tool Co.

Why not investigate—today—the production facilities and know-how that may effect substantial savings in your metal parts production?

Write or phone

Telephone:
WEstfield 2-7300

A. K. TOOL CO., INC.
Highway No. 22 · Mountainside 5, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1914

REPUBLIC

TWIST DRILLS REAMERS

Whether it is for No. 40 holes in Titanium sheets for Jets or 1 3/16" holes in thick armor plate, Republic Drills give more holes per drill and more holes per hour of direct labor.

REPUBLIC DRILL & TOOL CO.
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.

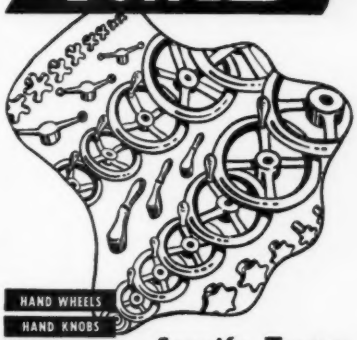
MAKERS OF "CELFOR," "CENTURY," "REPUBLIC" AND "U.S. EAGLE" BRAND TOOLS

3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES

CHICAGO PLANT
322 SOUTH GREEN ST., CHICAGO 7, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1915

Tomco



HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO
1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 1916

CIRCLE INFORM-A-GRAM KEY NO. 1904

CIRCLE INFORM-A-GRAM KEY NO. 1905

FREE

new catalog 601...

FORD

cutting tools

12 pages packed full of data on Ford's complete line! Includes H. S. S. and Carbide Rotary Files and Cutters, Countersinks, Carbide End Mills, Grinding Burrs and special tools. Lists all styles, shapes and sizes in easy-to-read tables. Gives dimensions, angles, operating data. Concise descriptions. Illustrated throughout. Your handy reference book on Ford cutting tools. All ground tools are *precision machine ground* . . . tooth spacing is uniform and relief angles are constant on each tool . . . which means faster cutting, longer life, better finishes. Send in today.

Rotary FORD Tools

M. A. FORD MFG. CO., INC.
817 W. River Street, Davenport, Iowa

YES, send me new free Catalog 601 and latest price sheet on Ford Cutting Tools.

NAME

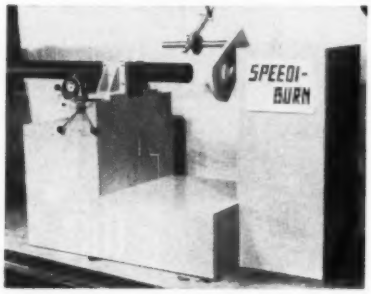
FIRM NAME

ADDRESS

CITY ZONE STATE

CIRCLE INFORM-A-GRAM KEY NO. 1921

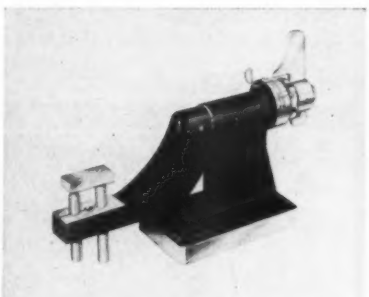
Straight Cut-Off and Beveling Operations on medium and large diameter bar stock and pipe are performed by a new flame cut-off machine. For pipe cut-off operations, the torch is mounted radially and for



beveling pressure piping, the torch is mounted in an adjustable angle clamp and set to the desired bevel angle. Speedi-Burn Products Co., 534 Linden St., West Hempstead, N. Y., or — **Circle No. A44.**

Tap and Drill up to 8 holes on any tapping or drilling machine with a flexible shaft driven adjustable spindle multiple head. The Ettco-Emrick Model 800 head permits a wider range of hole patterns with a smaller drive to spindle distance than conventional geared or universal joint spindle adjustable heads. It can be used horizontally or vertically. Capacities of the unit range to 5/16" drills and taps in aluminum. For further details, get Bulletin 600 from Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, or — **Circle Inform-A-Gram No. A45.**

Dress Either a Convex or Concave Radius from 0.015" to 1.750" on any grinding wheel up to 10" dia with a new radius dressing tool. The G-5 radius dresser has graduated stops that allow the operator to dress any portion of a wheel's radius. It has



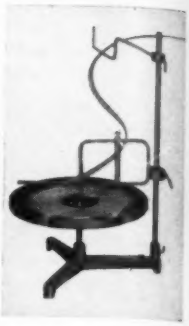
a spring tension journal for chatter-free operation. The G-2 Angle Dresser and the G-5 Radius Dresser can dress radii and angles tangent to each other. Rothfuss Tool Co., Box 202, Elmwood Sta., Providence 7, R. I., or — **Circle No. A46.**

economically priced press room equipment

DURANT Automatic Stock Reels

Operates by natural spring of uncoiling stock. Priced from $85.00. Nine other models of stock reels in vertical, horizontal, motorize or automatic types for all applications.

Manufacturers of Stock Reels, Roll Feeds, Straighteners, Scrap Choppers, Die Pullers, Foot Presses, Coil Cradles, Press Guards, Stock Oilers.

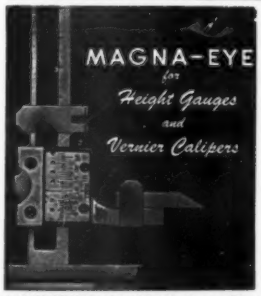


WRITE FOR NEW FREE CATALOG

DURANT Tool Supply Co.

PROVIDENCE 3, RHODE ISLAND

CIRCLE INFORM-A-GRAM KEY NO. 1922



MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 6 No. 100 for 6" Vernier Calipers; 6 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 6 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.
For Complete Information Write, Phone or Wire

STEBAR COMPANY
217 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1923

Precision-Made

FIXTURE CLAMPS & DETAILS

Heat-treated and Corrosion Resistant

QUICK SERVICE

CATALOG AVAILABLE

HARCO **HARCO ENGINEERING**

12092 Woodbine Detroit 39, Mich.
Telephone KEnwood 3 7799

CIRCLE INFORM-A-GRAM KEY NO. 1924

Production UP at NORTHROP

KNU-VISE clamps help cut drilling time

MODEL HS-400

Wherever fast, positive material holding is required—Knu-Vise toggle-action clamps are helping manufacturers do a better job.

One application is shown above. This time Knu-Vise clamps are in use on a special fixture developed by Northrop Aircraft engineers for simultaneous drilling of seven rocket pod orifice holes for the Northrop F-89 Scorpion. Drilling time has been reduced from 10 hours to 45 minutes—including set-up time.

REMEMBER—if you have a holding problem—Lapeer Mfg. Co. offers a wide range of hand, air and oil operated clamps to increase efficiency and lower costs. Our catalog contains complete information. Write for your copy today.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**

3064 DAVISON ROAD • LAPEER, MICHIGAN

WESTERN DIVISION 422 Magnolia, Glendale, California • CANADIAN DIVISION Higginson Engr., Hamilton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1931

BRYANT TRUE GRANITE SURFACE PLATES

ROCK OF AGES

Unequalled Wear Resistance!

All Bryant Surface Plates are manufactured from fine-grained *true quartz* granite. Their resistance to wear surpasses *all* other materials used as surface plates.

Patented "head of the grain" finishing process gives added assurance of retained accuracy through years of use.

Full range of sizes available from the same selected black-and-white true granite, in precision, standard and layout accuracies.

Convenient stands feature both utility and appearance.

Write for quotation, stating size and accuracy desired

BRYANT GAGE & SPINDLE DIVISION

Box 620-H, Springfield, Vermont

Internal Grinders • Boring Machines • Granite Surface Plates • Groove Gages
Internal & External Thread Gages • Magnetic Drums for Computers

DIVISION OF BRYANT CHUCKING GRINDER COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 1933

ULTRA-CHEX GAGE BLOCKS

for Every Need!

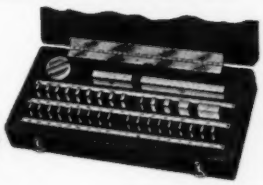
Supplied in one Superior Accuracy

5 MILLIONTHS ± ACCURACY

82 Block Set

$303.00 Complete

This Set will supply the needs of any discriminating shop that must work to gage-block precision.



34 Block Set $132.50

WITHOUT OPTICAL PARALLEL

9 Block Set $24.75

OPTICAL PARALLEL **$6.00**

QUICK DELIVERY ON ALL SETS

All Sets at "Money Saving Prices" due to Mass Production Methods.

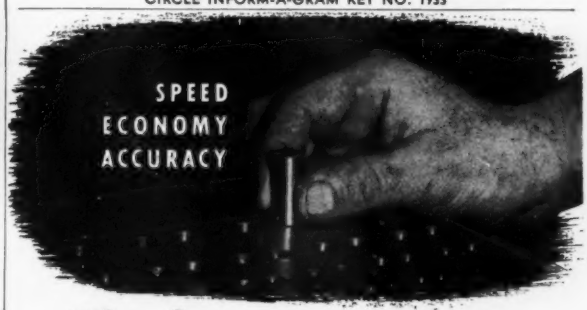
WRITE FOR FULLY ILLUSTRATED CATALOG -- *Code GIPFY*

GEORGE SCHERR CO., Inc.

COMPLETE LINE OF PRECISION INSTRUMENTS

200 -T LAFAYETTE STREET • NEW YORK 12, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1932



Horberg **PIN GAGES** *drill sizes taper entry*

Unlimited time and cost saving advantage in set-up, production, final inspection, wherever holes or slots must be accurately gaged, determined and located.

- Accurate to —.0001" —.0000"
- Concentric taper on lower half .001" smaller than gage size.
- Oil hardened tool steel — standard 1½" length.

PAIRED SETS IN CONVENIENT, INDEXED PLASTIC CASE

Letter sets — 52 gages, A-Z in pairs
Fraction sets — 60 gages, 3/64" to ½" in steps of 1/64" in pairs.
Number sets — 120 gages, 1 to 60 in pairs
Individual gages in stock — extra stands available
All items stocked for immediate delivery

THE *Horberg* GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

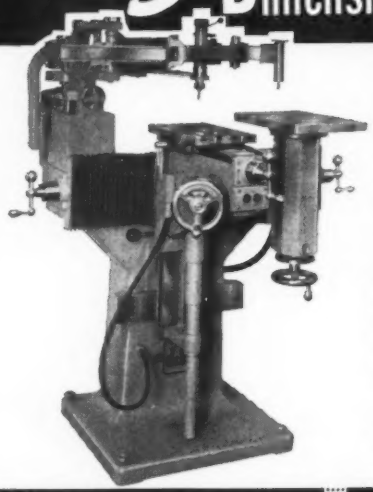
QUANTITY		
____	Letter Sets	@ $ 60.00
____	Fraction Sets	@ $ 66.00
____	Number Sets	@ $120.00
____	Single gages	@ $ 1.50
____	Case alone	@ $ 15.00

Please rush checked items and literature to:

COMPANY _____
ADDRESS _____
NAME _____
TITLE _____

CIRCLE INFORM-A-GRAM KEY NO. 1934

3-Dimensional panto-miller



For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard and special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller

Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Investigate its advantages for your own applications. Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin IT3.

WITH RIGHT ANGLE ADAPTOR

WITH FACE PLATE

J&B EST. 1870

JOHNSON & BASSETT, INC.

PRODUCTION TOOL DIVISION

WORCESTER, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1941

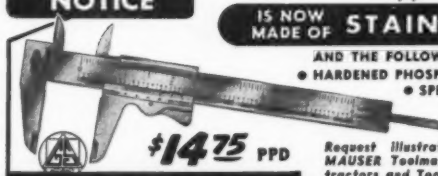
IMPORTANT NOTICE

The Genuine MAUSER **VERNIER CALIPER**

IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED

- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
- SPECIALLY LONG VERNIER to read thousandths
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back



$14.75 PPD

Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Stands.

GEORGE SCHERR CO., Inc. 200-T Lafayette Street • New York 12, New York

CIRCLE INFORM-A-GRAM KEY NO. 1942

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1943

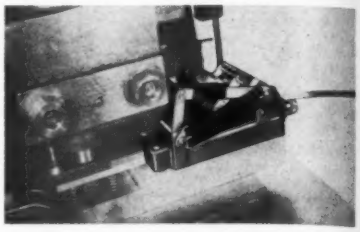
CAMS ALL TYPES MADE TO YOUR SPECS

Charles Eisler Jr.
President

EISLER ENGINEERING CO., INC.
732 SO. 13TH ST., NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1944

A Line of Low Cost Stock Feeds has been announced by Jaco Devices, Inc., 96 High St., Hingham, Mass. The Jaco-Matic Feeds are made in 3 models to handle coiled stock in a range of widths up to 4", thicknesses up to 3/32", and a range of feed stroke lengths up to a maximum of 4". Micrometer adjustment allows the



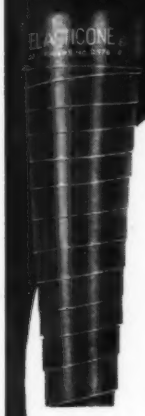
feed stroke to be set to an accuracy of 0.001". The feeds are designed to maintain full control of the material during the feed stroke with a tungsten carbide steel gripper blade. They can be mounted on the die set or press table or any type of mechanical, hydraulic, compressed air, or electrically operated press. **Circle Inform-A-Gram No. A47.**

A Wide Range from ½" to 4" is covered by 19 reamers. These Wickman-Brown adjustable floating reamers were originally supplied in a set of 14 units, giving a range from ¾" to 4". The two blades of the tools are adjustable by direct reading micrometer and have positive and constant float. The blades can be supplied in high speed steel or tungsten carbide tipped. Wickman Mfg. Co., 10325 Capital Ave., Oak Park, Detroit 37, or — **Circle No. A48.**

This Combination Coil Cradle and Power Driven Straightener will handle material up to 9" wide in thicknesses ranging from 0.025" to ⅛". It coils with O.D. up to 40" and weight up to 1500 lbs. The unit features casters for portability and a

cradle with 5 coil rest rolls mounted in self-aligning bearings. A 2-hp variable speed drive provides outputs from 49 to 197 ft/min. U. S. Tool Co., Inc., Ampere (East Orange), N. J., or — **Circle No. A49.**

MAJOR AIRCRAFT MAKERS SAVE $954,000. ON DIES EQUIPPED WITH



ELASTICONE
GUIDE PIN COVERS

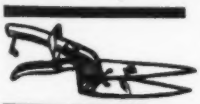
The facts speak for themselves and show how all industries are now reducing costs of die programs by using Elasticones for closing the gap between pins and bushings, protecting dies against breakage, reducing the need for spare dies. *Low costing* Elasticones are available to fit most pins and bushings.

Write for complete literature and technical data.

CENTRAL Safety Equipment Co.
6608 MARSDEN ST. PHILADELPHIA 35, PA.

CIRCLE INFORM-A-GRAM KEY NO. 1951

use this special, thin GRIPCO JAM NUT



to get a positive lock on bolts subjected to shearing stresses where the strength of a full nut is not required. The thin GRIPCO Jam Nut locks without the use of lock washers or other parts. The nut itself does the WHOLE job—so shorter bolts can be used. Applicable on such products as valve handles, casters, garden and pruning shears, hedge clippers, sickle bars, etc. GRIPCO JAM NUTS are manufactured in the new Unified Finish and Heavy Series (Hexagon). Furnished in standard full and jam dimensions, in steel, brass and aluminum. *Write for samples and full particulars*

GRIPCO PRODUCTS INCLUDE:
Gripco Lock Nuts, New Gripco "Clinch" Nuts, Gripco Hi-Nuts, Gripco Pilot-Projection and Countersunk Weld Nuts with or without Gripco locking feature.

111

GRIP NUT COMPANY
"after 50 years still holding strong"
107 MAPLE AVE., SOUTH WHITLEY, IND.

CIRCLE INFORM-A-GRAM KEY NO. 1952

"Do-it-Yourself" pays off in heat treating

1700 SERIES

Why let someone else set your production schedules? If you now depend on outside heat treat sources, consider all the advantages of heat treating tools, dies, parts, etc., right in your own shop with a versatile TEMCO electric furnace. No bother with time-wasting pickup and delivery of work . . . no downtime while waiting for it to come back. Saves hours on jobs. Cuts costs . . . for TEMCO furnaces are economical to own and operate. Easy to hook up . . . easy to use. Eight models with chamber sizes from 4" x 3¾" x 3¾" to 9½" x 8½" x 18". $60 to $561.50 complete with controls. Write for data and nearest dealer's name.

TEMCO® ELECTRIC FURNACES

THERMO ELECTRIC MANUFACTURING COMPANY
474 Huff Street, Dubuque, Iowa

CIRCLE INFORM-A-GRAM KEY NO. 1953

NOW FROM THIS CATALOG

NEW CARBIDE TOOLING PRECISION-MADE

Golden-Circle Rotary Tools

New! Elgin's expanded line of burs and rotary files, plus solid carbide end mills, all shapes and sizes precision-made. See how they can meet your requirements at lower cost! Write for your FREE copy of the new "Golden Circle" booklet today!

ABRASIVE DIVISION, DEPT. D
ELGIN NATIONAL WATCH COMPANY
Elgin, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1954

CIRCLE INFORM-A-GRAM KEY NO. 1943 | CIRCLE INFORM-A-GRAM KEY NO. 1944

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

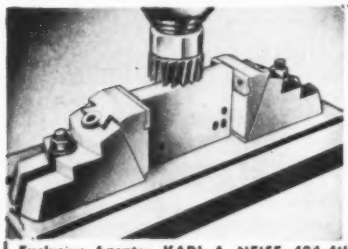
Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1961



MASTER GRIPPING CLAWS

System Hubner

WHY use them?

1. Clamping action Vertical as well as Horizontal—pressing workpiece down directly on the machine table. No hammering and still no air between.
2. Gain more working room.
3. Faster and more secure setups. Easier to handle.
4. Unlimited jaw opening.
5. No straps overlapping on the workpiece; more machining surface.
6. Extremely versatile—take light cuts or heavy cuts, use on small machines or heaviest production machines.

NEISE MODERNTOOLS

Exclusive Agents: KARL A. NEISE, 404 4th Ave., N. Y. 16, N. Y., Dept. TP

CIRCLE INFORM-A-GRAM KEY NO. 1962

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

HORIZONTAL

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use $89.95

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

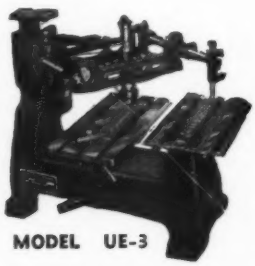
333 Nassau Avenue Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1963

FOR —

PRECISION ENGRAVING

in STEEL and other METALS and PLASTICS you can't beat the well-known PREIS-PANTO line of Engraving Machines and Accessories.



MODEL UE-3

Many models available for either 2 or 3 dimensional engraving and die cutting.

Trade Mark PANTO

Write for details.

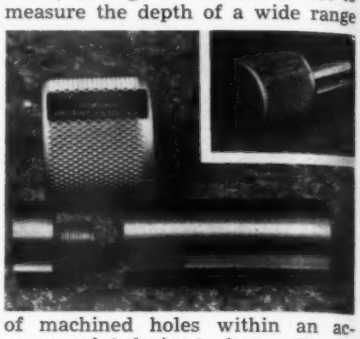
For immediate attention write directly to manufacturer below. Ask for nearest representative.

H. P. PREIS Engraving Machine Co.

647 U. S. Route 22 Hillside, N. J.

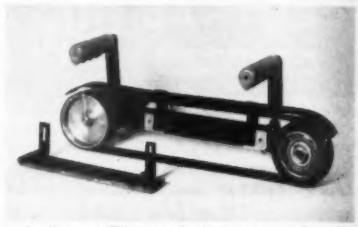
CIRCLE INFORM-A-GRAM KEY NO. 1964

An Adjustable Flush Pin Gage which can be set to a wide range of sizes for varying production dimensions has been introduced by Size Control Co., 2500 W. Washington Blvd., Chicago 12. It can be set to measure the depth of a wide range



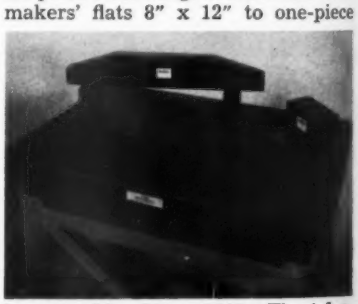
of machined holes within an accuracy of 4 decimal places. To adjust the gage, loosen a locking screw, turn the adjustable contact to the proper dimension, and relock the screw. **Circle No. A50.**

For Grinding Light Weld Beads, Soldering Joints, deburring large parts, and performing polishing operations, use the universal air-powered portable belt grinder. It can be either a right- or left-hand



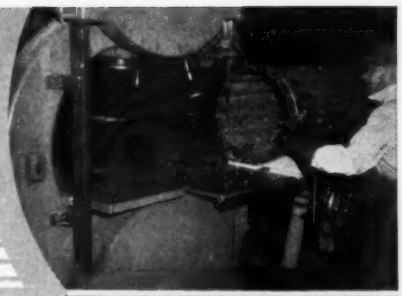
grinder. The grinder can also be bench mounted for off-hand grinding, polishing, and deburring on the contact wheel. Abrasive Machinery Corp., 432 S. Pennsylvania St., Indianapolis 25, or — **Circle Inform-A-Gram No. A51.**

Black Granite Surface Plates and accessories are now being manufactured by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Granite plate sizes range from small toolmakers' flats 8" x 12" to one-piece



layout tables 72" x 144". The tolerance for the overall surface area of the plate is stated, thereby defining the rated accuracy. They feature hardness greater than steel, extreme rigidity, and dull non-glare finish. **Circle Inform-A-Gram No. A52.**

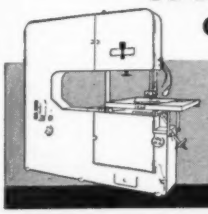
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS



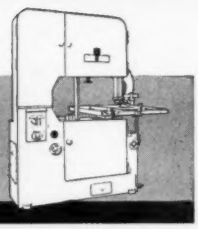
FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1971

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work now—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

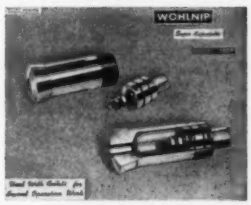
CIRCLE INFORM-A-GRAM KEY NO. 1972

GET ABSOLUTE *TOLERANCE HOLE DEPTH CONTROL*
with **WOHLNIP** NON-ROTATING DRILL STOPS

Will not mar, mark or damage the face of the work, fixture or bushing, yet give POSITIVE CONTROL OF HOLE DEPTH. Completely automatic, the WOHLNIP Drill Stop reduces human errors, simplifies difficult jobs, lowers machining cost, increases production, and eliminates rejects. Used for drilling, center drilling, countersinking, boring, milling, routing, reaming. Available with straight or taper shank, for any size drill or tool. (Patent Pending)

EXCLUSIVE DISTRIBUTORS WANTED

WOHLNIP Products, Inc.
634 Central Avenue • East Orange, New Jersey



COLLET STOPS
(Patent Pending)

Used with collets for second operation work. Assuring consistent accuracy, permanent set-up, producing identical results. No alterations to your collets are necessary. Fully adjustable. Available for any size collets. END GUESS WORK AND REJECTS—

CIRCLE INFORM-A-GRAM KEY NO. 1973

PRESSURELOK-224
the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 1974

Buy safe "SHUR-GRIP" drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes remolding easier, quicker, surer, less expensive.

Write for circular and prices

LAWRENCE H. COOK, INC.
68 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1975

HIGHER SPEEDS!
FASTER GRINDING!

kipp

AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

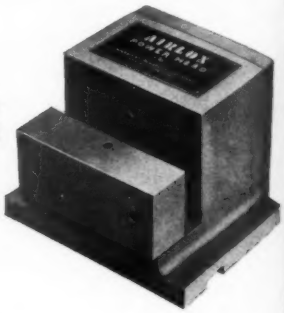
kipp

MADISON-KIPP CORP.
212 Waubesa St. • Madison 10, Wis., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1981

If 1000 lbs. Push Is Enough . . Power Head Is the Answer!

New
AIRLOX
POWER HEAD
No. 400



- POWER FOR FIXTURES
- MAKE YOUR OWN AIR VISES
- WELDING POSITIONING
- USE SINGLY OR IN MULTIPLES

Power Head
Foot or
Hand Valve
5 foot Air Hose

$67.50
F.O.B. WHITEHALL, NEW YORK

Specifications:
Height: 4-13/16"
Width: 6-1/2"
Length: 5-3/8"
Weight: 24 lbs.
Ratio of Push to Air Pressure: 12-1/2
Stroke: 1" Spring Return

production devices incorporated
WHITEHALL, WASHINGTON COUNTY, N. Y. PHONE 40

CIRCLE INFORM-A-GRAM KEY NO. 1982

Cut costs on hole cutting with . . .
BOREMASTER

Finished holes 1½" to 11¾" diameter to a depth of 8" on your present equipment
with
THE BOREMASTER

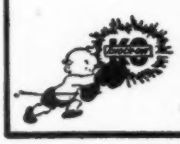
Not just another Trepanning Cutter but a real heavy duty tool. Stock removed in one piece eliminating waste. TIME SAVINGS + MATERIAL SAVINGS = COST SAVINGS

For full details write
NEISE MODERNTOOLS
KARL A. NEISE, Dept. TP
404 4th Ave., New York 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1983

Expanding Mandrels

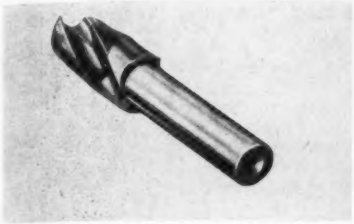
Accuracy 001" - No Distortion
No Slipping - Everlasting



K.O. LEE CO.
ABERDEEN, SOUTH DAKOTA
If it's made by Lee *it's a* "Knock-Out"

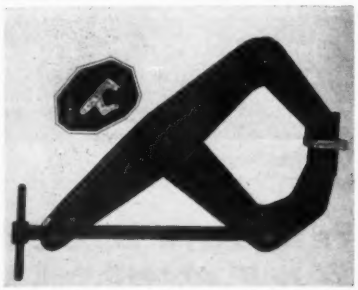
CIRCLE INFORM-A-GRAM KEY NO. 1984

The Advantages of a Solid Carbide Cutter are combined with the economy of a carbide tipped tool in a new spiral flute end mill which embodies a sandwich brazed, solid carbide insert. The true spiral design reduces cutting pressures permitting smoother, cooler operation



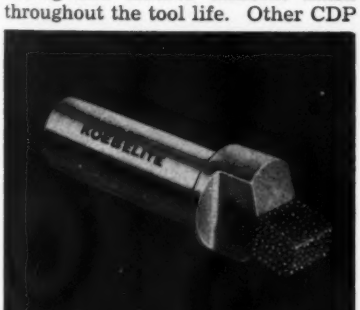
with better finishes to closer tolerances. The end mill is available in 2 series — for steel and for nonferrous metals — in sizes from ½" to 1". Nelco Tool Co., Inc., Manchester, Conn., or —
Circle Inform-A-Gram No. A53.

A 9" Kant-Twist Clamp has been produced by Saxton Mfg. Co., Inc., 1517 N. Potrero, El Monte, Calif. The jaws of this heavy-duty clamp

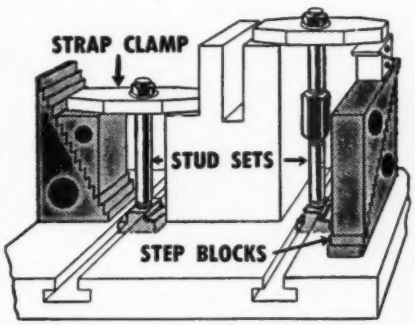


are each grooved on one face and serrated on the opposite face. Shown with the clamp, for contrast, is the 1" model.
Circle Inform-A-Gram No. A54.

For Wheel Dressing of centerless, heavy duty external grinders, use CDP-400 Series diamond tool. This self-perishing cemented diamond particle tool eliminates costly resetting and assures uniform finish throughout the tool life. Other CDP



tools are available to handle various wheel dressing operations. Details on the tools are in Form 356 from Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13, or —
Circle Inform-A-Gram No. A55.



SURE-GRIP STEP BLOCKS

Clamping tools of all types.

Write for free tracing templates

TIETZMANN TOOL CORP.
Box 277
North Main St., Englewood, Ohio

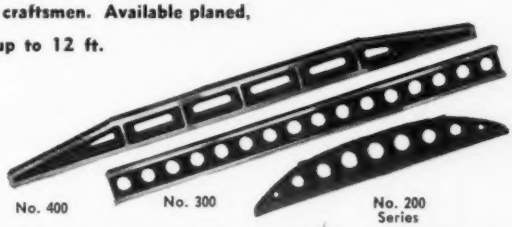
CIRCLE INFORM-A-GRAM KEY NO. 1991

"MILWAUKEE" *Straight Edges -*

Famous for long-lasting accuracy. Made from Meehanite—fashioned by skilled craftsmen. Available planed, scraped, or ground. Sizes up to 12 ft.

Write for Bulletin

J. C. BUSCH CO.
Engineers & Machinists
Since 1907
175 S. Barclay St.
Milwaukee 4, Wis.



CIRCLE INFORM-A-GRAM KEY NO. 1992

DEKA BORE

OFFSET BORING HEAD

repeats to

.0001"

in 30 seconds

DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

100% GUARANTEED!

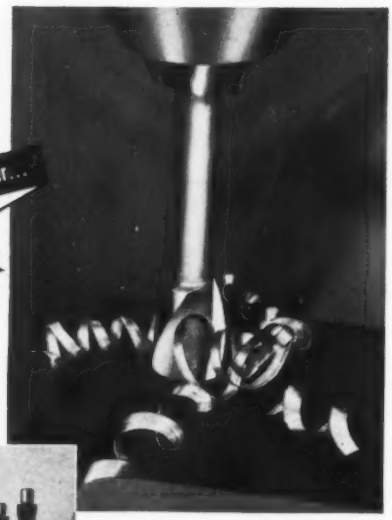
PRECISION TOOL & MFG. CO. OF ILL.
1305 South Laramie Cicero 50, Illinois TP-6

Gentlemen: Please send me
☐ Name of nearest DEKA-BORE distributor, who will arrange free demonstration.
☐ Free literature and prices.

NAME _____ TITLE _____
FIRM _____
ADDRESS _____
CITY _____ ZONE ____ STATE ____

CIRCLE INFORM-A-GRAM KEY NO. 1993

WELDON
"TU-LIP" COUNTERBORES



for
FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

WRITE FOR LATEST CATALOG NO. 10.

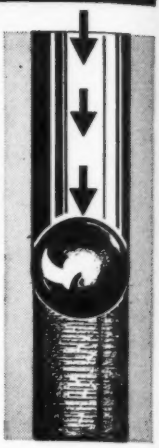
THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2001

BALLIZING

For NEW Speed and Economy in Hole Sizing and Finishing



BALLIZING is a precision high-production process for sizing and finishing die-cast, drawn, and machined holes — simply by pressing a ball through the unfinished hole. With alloy steel and tungsten carbide balls available in practical quantities and in any size required, this process is used with holes of all diameters.

MAJOR ADVANTAGES:

FAST; takes only seconds. ACCURATE. FINE FINISH — burnished smooth. ECONOMICAL. Uses unskilled labor. No tool sharpening. No close adjustments. No special equipment.

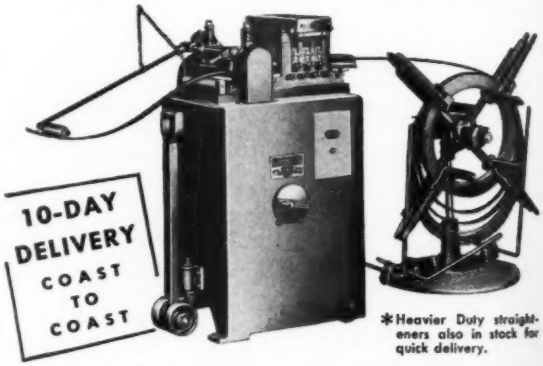
FREE BALLIZING BULLETIN gives details; shows typical applications. May we send you a copy?

INDUSTRIAL TECTONICS, Inc. ANN ARBOR 7, MICH.

ITI PRECISION BALLS
All Materials — All Sizes
In Large or Small Quantities

CIRCLE INFORM-A-GRAM KEY NO. 2002

STRAIGHTEN COIL STOCK
from ½″ to 8′ wide...
from .018″ to .065″ thick...
on a LITTELL "308"*



*Heavier Duty straighteners also in stock for quick delivery.

Littell "308" Variable Speed Straighteners flatten coil stock...synchronize feeding of stock with speeds of automatic presses . . . simplify hand feeding. The "308" has brought new speed, efficiency and economy into stamping, blanking and shearing operations from coast to coast. Get full details on these portable straighteners.

Write for Catalog Section 3H

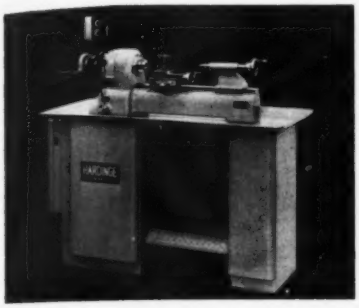
F. J. LITTELL MACHINE CO.
Speed with Safety

ROLL FEEDS • COIL CRADLES
STRAIGHTENING MACHINES
REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland

4197 N. Ravenswood Ave. • Chicago 13, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 2003

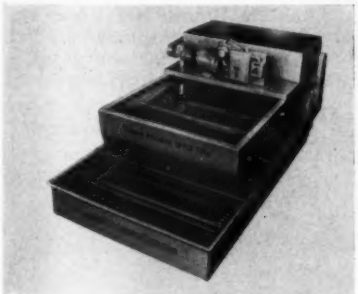
Spindle Speeds Can Be Changed Instantly by pushbutton control on this high speed precision lathe, making possible more parts at lower cost and of high quality. Model DV59 features a ball-bearing, lever-operated collet closer which assures fast,



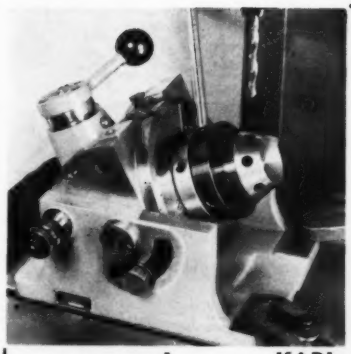
easy, and positive collet gripping. Fitted with the new 5C Hardinge collet, the lathe has extra large 1 1/16" capacity. Hardinge Brothers, Inc., Elmira, N. Y., or —
Circle Inform-A-Gram No. A56.

A Hopper Feeder receives parts, such as gear blanks, bearing races, pistons, screw machine products, etc. at any rate, in bulk, with random orientation. It discharges parts, orientated and aligned, for the following machine at any position and on demand of the machine. The hopper feeder which features freedom from jamming can be adapted to a wide range of machines; processes; and parts, sizes, and shapes. It can be equipped with a conveyor system to elevate and convey parts or a gage to reject parts that do not meet specified tolerances. Cargill Detroit Corp., Birmingham, Mich., or—**Circle Inform-A-Gram No. A57.**

The Delpark Up-Flo Filter makes use of a flat magnetic field onto which the liquids are diffused. The Up-Flo action carries the exposed liquids up through a permanent 0.004" bar stock bronze screen to remove particles which don't respond



to magnets. The filter is highly efficient for coarse grinding operation. It is also available without magnets. Industrial Filtration Co., Dept. UM-299, Lebanon, Ind., or —
Circle Inform-A-Gram No. A58.



Another **WALTER**
Precision Dividing Head

- High, Long-lasting Precision.
- Horizontal and Vertical Operation.
- Quick Indexing and Degree Indexing.
- 6 and 3 Minute Readings with Vernier.
- Easy Operation.
- Versatility Increased by Various Accessories.

Also Universal, Semi-Universal and simpler models and PRECISION ROTARY TABLES in various sizes and executions.

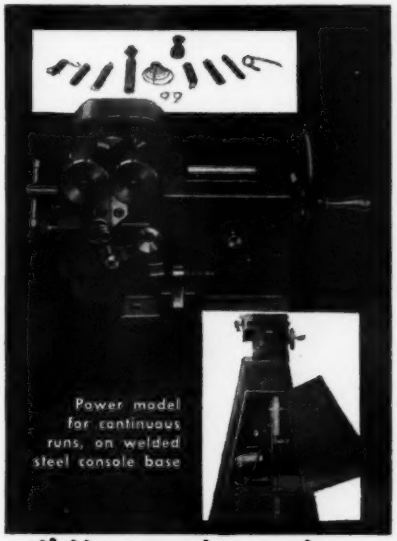
Each tool supplied with a test report. Max. Permiss. Error Chart supplied with literature.

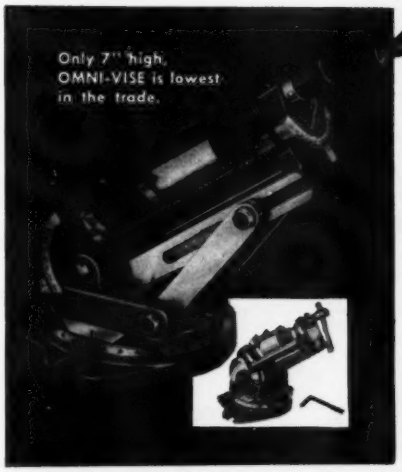
Sole Agents:
MODEL EST One-Way Tilting
KARL A. NEISE
404 Fourth Avenue New York 16, N.Y., Dept. TP
NEISE MODERNTOOLS

CIRCLE INFORM-A-GRAM KEY NO. 2011

Make any type spring, without arbors, FAST with Perkins Spring Coiler!

When you need a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with the new Perkins Precision Spring Coiler! You entirely eliminate the use of arbors, yet turn out precision springs — torsion, compression, extension tapered, or special springs — coiled either left or right hand, in any desired length, any diameter from 1/16" to 12" and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications for replacements or experimental work. Make them fast right in your own shop!





Hold any machine work at any EXACT angle with sturdy OMNI-VISE!

Accurately set in all three planes in only 15 seconds, this sturdy precision vise made in two capacities saves time and headaches for progressive shop operators and pays for itself quickly. Only 7" high (lowest in the trade), **OMNI-VISE** #4, shown at top, is tough, weighs 74 lbs. Jaws are 4" x 1½", open to 4". Base is 9" in diameter with one side straight. Inset shows **OMNI-VISE** #2, a precision low-priced vise. Users find it exceptional for grinding compound angles on carbide tools. Weight, 16 lbs. Height, 4¾". Jaws, 2⅛". Opening, 2⅛". Base, 7¼" x 5". For grinding, drilling or general work at any angle, by hand or machine, an **OMNI-VISE** is the machinist's choice.

EXCLUSIVE DISTRIBUTORS OF PRECISION MACHINE TOOLS
Connors and Davis Sales Corporation
606 CIRCUIT AVENUE, WEST SPRINGFIELD, MASS.

CONNORS AND DAVIS Sales Corp
606 Circuit Ave West Springfield, Mass.
Please send detailed information and prices on:
PERKINS SPRING COILER hand ☐ power ☐
OMNI-VISE #4 ☐ #2 ☐
Name_____ Title_____
Company_____
Address_____
City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 2012

For Better Knurling

NEW

KNURLMASTER

$13.50

Hand Knurler

No distortion — even on ⅛" stock! MODEL "C"

For small production runs on ⅛" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

DEALERS INQUIRIES INVITED

ROCKWIN MANUFACTURING CO.

80A Magnolia St., Westbury, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2021

REID TOOL ROOM Accessories

DISHED

STRAIGHT

COUNTER BALANCED

CAST IRON HAND WHEELS

Solid Web and Counter Balanced. Made of fine grain cast iron. Center hole and faces of hub are true to rim. Rims and handles are ground and polished to high lustre. Adds distinction to product. Top quality. Low prices. Many sizes. Immediate delivery. Alterations when required at nominal prices.

MALLEABLE MACHINE HANDLES

STRAIGHT

In Straight, Crank and Offset types. Many sizes. Will withstand severe usage. Neat. Ready for use.

WIDE LINE OF REID ITEMS

Including plastic and steel ball handles. C. I. Hand Knobs, Compression Springs, Balanced Cranks. Clamping Levers, etc.

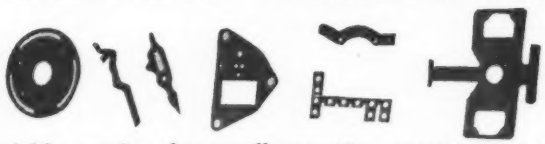
Quality at Moderate Prices!

FREE 60 Page Catalog

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 2022

STAMPINGS - - - SHORT RUNS



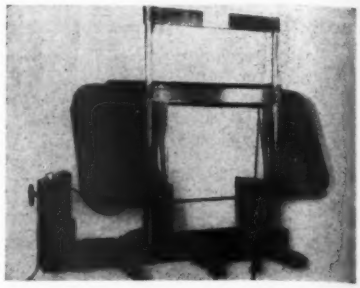
A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

Linden 3-3700 "Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

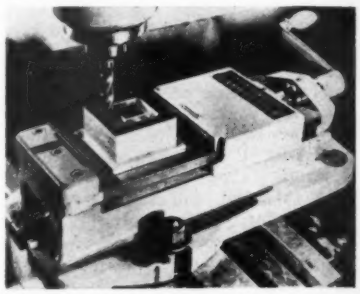
CIRCLE INFORM-A-GRAM KEY NO. 2023

A Cutting Capacity of 38" Rounds or Squares is a feature of a new Giant metal cutting band saw. The blade is driven on 4 wheels at speeds of 2000, 1500, and 1000 fpm, suitable



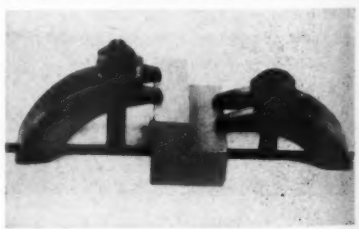
for cutting carbon, magnesium, aluminum, and brass. By specifying other speed ranges, the saw is adaptable for cutting a variety of materials. W. F. Wells & Sons, Three Rivers, Mich., or —
Circle Inform-A-Gram No. A59.

Eliminate Many Setup Operations with a machine vise that pulls the work downward when closed for accurate seating and fast machine setups. The IMP "Hold-Down" vise clamps laterally and downwardly at the same time and work is held flat on the base as if by magnetic force.



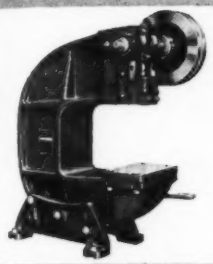
The work is held so accurately that many secondary surface grinding operations can be eliminated. Illinois Metal Products, 429 W. Superior St., Chicago 10, or —
Circle Inform-A-Gram No. A60.

Eliminate Shims and Vises with new instant hold-down clamps. With "Insta Clamps," even one prong in position is strong enough to hold the



workpiece firm. Two or more of these clamps quickly lock any shape workpiece in position. Bausch Products, 18411 W. McNichols, Detroit 19, or—**Circle Inform-A-Gram No. A61.**

KENCO
1½ to 15 ton
PUNCH PRESSES
...dependable



You get precision punching and high volume *consistently* with a Kenco press. It's built to eliminate downtime — with long-wearing parts and trouble-free assemblies. Needs adjustments seldom . . . replacements practically never. Write for literature.

KENCO MANUFACTURING CO.
Mfrs. of Precision Machinery and Accessories
5211 TELEGRAPH ROAD • LOS ANGELES 22, CALIFORNIA

Extra long ram ways permit full use of guiding area to insure precision punching.

High strength castings used on clutch collar (illustrated), frame and ram ways — for extra rigidity and wear.

CIRCLE INFORM-A-GRAM KEY NO. 2031

LEITZ OPTICAL JIG BORER

6" x 6" LINEAR CAPACITY FROM MASTER GLASS SCALES IN .00005"—8" CIRCULAR CAPACITY IN 10 SECONDS OF ARC—OBLIQUE HOLES UP TO 15 DEGREES FROM VERTICAL.

BUILT-IN MICROSCOPE WITHIN SPINDLE CONVERTS MACHINE INTO CO-ORDINATE MEASURING MICROSCOPE

REQUEST CATALOG 8089

Geo. SCHERR OPTICAL TOOLS, Inc.
200 -T **LAFAYETTE STREET • NEW YORK 12, N.Y.**

CIRCLE INFORM-A-GRAM KEY NO. 2032

SPEED UP PRODUCTION
with these PALMGREN
ANGLE VISES · MACHINE VISES
ROTARY TABLES

See how Palmgren vises, rotary tables, milling attachments and other machine tool accessories can speed up YOUR production and save time and money, too. Used in all industries, EVERYWHERE. 64 different models and types. Send for new catalog No. 203.

$39.95

No. 24B ANGLE VISE
4" jaw
Solve difficult Angle jobs on the production line—quick, accurate setups at any angle in such operations as drilling, milling, grinding. Also other jaw sizes: 1½", 2½", 3", 4", 6" and 8".

No. 60B MACHINE VISE
6" jaw
$99.95
A precision vise, with or without swivel base, constructed for heavy-duty service in such jobs as milling, drilling, grinding, shaping and other operations requiring a rugged holding device. Also 40B—4" jaw.

$79.95

No. 83 ROTARY TABLE
Two cross feed slides and Rotary Feed converts your drill press for vertical milling. The No. 83 has an 8" diameter top with T slots ⅝" x 1" x ⅝16" for keys or T bolts. Rotary dial is graduated in 3 minute intervals.

CHICAGO TOOL AND ENGINEERING CO.
8388 South Chicago Ave. • Chicago 17, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2033

Would *you* use a ruler for *precision* measurements?

Pretty silly question. But it's one way of pointing out the solid advantages of JO-LINE Torque Tools over ordinary torque equipment...about like a micrometer as compared with an ordinary ruler. The JO-LINE Torque Wrench gives you:

★ **TORQUE LIMITATION** Here—responsibility for exact torque control rests squarely with the wrench itself—not with various operators.

★ **ACCURATE CALIBRATION** Each JO-LINE Torque Wrench is calibrated to less than 1% error, and is *certified to* within 3% accuracy in writing.

★ **JUST SET YOUR TORQUE** . . . cuts out automatically . . . no lights, dials, or gauges to read. Lightweight and well-balanced, the JO-LINE is as easy to use as a socket wrench.

★ **CENTER OF TORQUE** Use one hand, two hands, or even a long extension handle...the JO-LINE always provides the same unvarying tension.

★ **RUGGED CONSTRUCTION** JO-LINE Torque Wrenches have been tested through 50,000 cycles. This built-in durability is supplemented by sealing the torque-sensing mechanism so that dirt or liquids cannot affect precision parts.

- *for torque requirements from 10 inch-ounces to 2000 foot-pounds*
- *designed to meet specifications MIL-H-4034A (USAF)*

Write today for your FREE JOMI Catalog with valuable Torque Table Data.

JO LINE TOOLS, INC. 8442 Otis St., Div. 22, South Gate 1, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 2034

Get smoother, more accurate *holes* with "ground-from-the-solid"

ACE

Drill Length AND *Chucking*

REAMERS

More holes faster . . . and at lower cost! That's what you want from a reamer, and that's what you get from Ace Drill Length and Chucking Reamers! They're made of pre-hardened H.S.S. and produced by the Ace "ground-from-the-solid" process. This gives them their highly polished right-hand spiral flutes . . . plus keener, longer-lasting cutting edges that produce smoother, more accurate holes. They're economical to use, too, particularly the drill length reamers. Because, with flutes nearly twice the length of chucking reamers, they can be re-ground more times for longer useful life. Next time you need reamers, ask your distributor for "ACE". If he doesn't have them, send coupon for complete details.

ACE DRILL CORPORATION
Adrian, Michigan

Gentlemen: Please send me your Catalog No. 52-A containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

NAME_____

COMPANY_____

ADDRESS_____

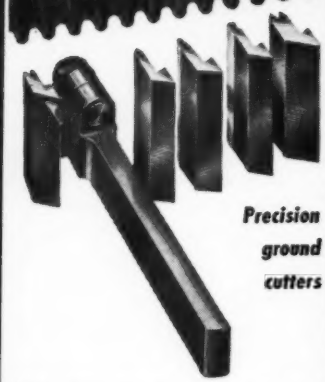
CITY_____ STATE_____

ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 2041

REDUCE THREAD CUTTING COSTS WITH NEW "ST" THREADING TOOLS



Precision ground cutters

Any Standard or Special Thread Form can be cut more precisely and economically with type "ST" Threading Tools.

We supply *long-life super HSS cutter* blades precision ground to any thread form. To resharpen these cutters only grind top face.

Type "ST" *Spring and Swivel* Threading Tool holders come in 4 sizes to fit any standard toolpost. This is the most dependable Toolholder for cutting a smooth Precision Thread and for easy adjustment of angle of lead.

We also carry a full line of *internal* threading tools.

Write for free catalog to:

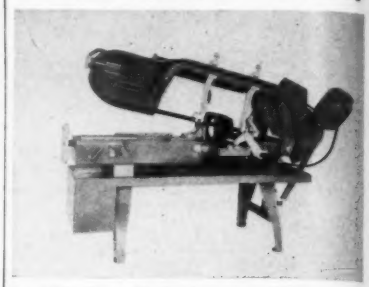
R. B. TOOL CO., Inc.
785 North Broadway
White Plains, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2042

STAR STAINLESS SCREW CO.
679 Union Blvd., Paterson 2, N. J.
Telephone: LIttle Falls 4-2300
Direct NEW YORK Tele. WI 7-9041
CORROSION RESISTANT

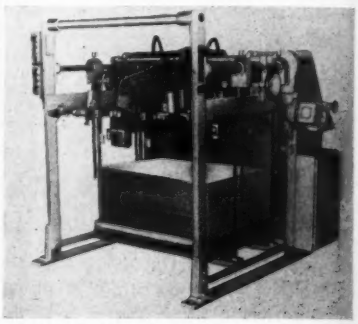
CIRCLE INFORM-A-GRAM KEY NO. 2043

Production Cut-Off Work is handled by a new metal cutting band saw. Model 1000 will take rounds to 10" and rectangular shapes 10" x 16", with extra capacity for end cuts up



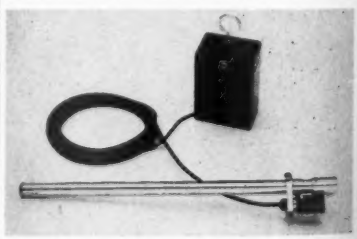
to 11" dia. It features a "Constant-load" blade tensioning device, and selective speeds of 50, 100, 175, and 275 fpm. Wells Mfg. Corp., 1940 Cedar St., Three Rivers, Mich., or — **Circle Inform-A-Gram No. A62.**

Feed up to 150 Sheets/Min to presses, coaters, slitters, shears, buffers, etc. with a new high speed metal sheet feeder. The feeder with a 9000-lb capacity elevator can be

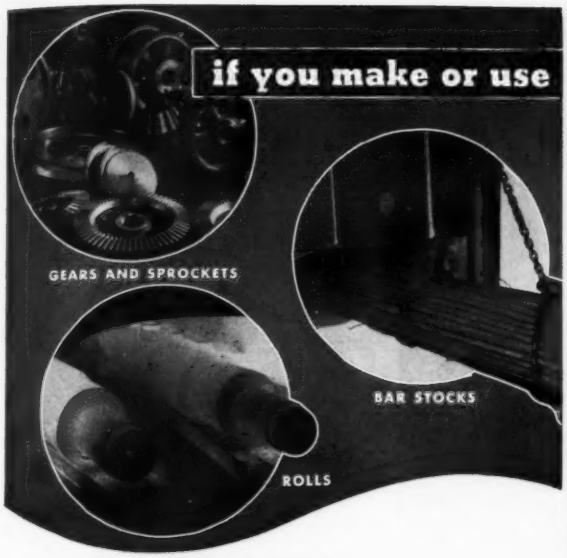


equipped for either rear or side loading. Sheets handled range in thickness from 38 to 20 ga in sizes from 19" x 19" to 44" x 48". Dexter Folder Co., Pearl River, N. Y., or — **Circle Inform-A-Gram No. A63.**

Inspect Plane Surfaces and the internal surfaces of cylinders with 4.5" dia or larger with a 50 power, right angle vision Borescope. One special application of Model B-210-A Micro-Borescope is for inspecting the porosity of chrome on internal surfaces



which have been chrome-plated and honed. It is made with working lengths of 16", 24", or 31". American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York 59, or — **Circle Inform-A-Gram No. A64.**



try LAKESIDE for Heat Treating . . .

Our Services: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting. Laboratory Physical Testing.

THE Lakeside Steel Improvement Co.
3418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100

CIRCLE INFORM-A-GRAM KEY NO. 2051

FREE... 64 PAGE CATALOG

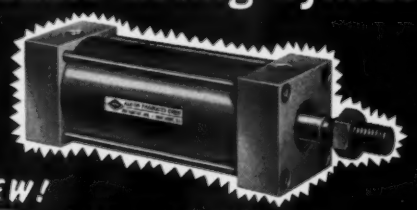
WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

JERGENS TOOL SPECIALTY CO.
Dept. TE-6 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 2052

Now...a truly low cost* double-acting cylinder



NEW!

Cylinder is also available with Alkon's exclusive elliptically ground piston rod. Non-rotating, it holds register *without* external guide ways!

1. OILITE CARTRIDGE type piston rod bearings—with 1 x 1 surface area and piston rod wiper.

2. NO METAL-TO-METAL CONTACT—tough nylon bearing mounted on large surface piston prolongs cylinder life.

3. UNIQUE CUSHION ARRANGEMENT—assures positive cushioning. Three types: 1" long, standard or adjustable; extra long cushions up to 6".

4. SELF ADJUSTING neoprene packings throughout; their block-vee design yields negligible friction.

5. THREE WAY flush rabbet mountings—front, rear, and horizontal are standard at no extra cost.

Operates on 250 psi (air), 500 psi (water or oil). Exceeds JIC standards.

COMPONENTS: Seamless steel, chrome plated, roller burnished barrel. High tensile heat-treated extruded aluminum heads. Stainless steel, hardened, ground and polished piston rods.

AVAILABLE FROM STOCK: Double and single acting cylinders, double-ended piston rod cylinders—cushioned or non-cushioned. Interchangeable mountings—foot, flange, swivel, pivot, rod clevis, (OEM specials). Write for free catalog.

Rustproof throughout

COMPARE THESE PRICES!

size bore	flush mounts model	flush mounts price	per inch of stroke	adjustable front or rear cushion
1¼	12	15.00	.45	6.20
1¾	24	19.00	.50	6.50
2½	49	25.00	.65	6.90
3½	96	36.00	.85	8.35

ALKON

ALKON PRODUCTS CORP.
200 Central Ave., Hawthorne, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2053

Get Speed!
Get Precision!

KUTMORE
ADJUSTABLE
HOLLOW
MILLS

• ANY COMBINATION OF . . . TURNING . . . TAPERING . . . FACING . . . CHAMFERING . . . TREPANNING IN **ONE PASS.** • EXCLUSIVE **MICROMETER** ADJUSTMENT FEATURE FOR RAPID SET-UP. • CUTTING CAPACITIES FROM 1/32" TO 2" DIAMETER IN STANDARD STOCK.

Our Engineering Department is at your disposal on your Hollow Mill problems.

1625 CLINTON AVE. NO.

CARL WIRTH & SON, INC.

Write For Catalogue 20TD

ROCHESTER 5 N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 2061

DEPENDABLE ACCURACY

INSPECTION TOOLS made of MEEHANITE METAL are designed to fill your various Inspection and Checking needs. Sturdily constructed to give you reliable, accurate service.

Surface Plates — Box Parallels
Slotted Angle Plates
Universal Right Angles
Flat Parallels — Lapping Plates
Toolmaker's Knees — "V" Blocks
Straight Edges (Bridge Type)
Straight Edges (Leveling Type)
Measuring Irons
Masterangle Plates
Angle Attachments

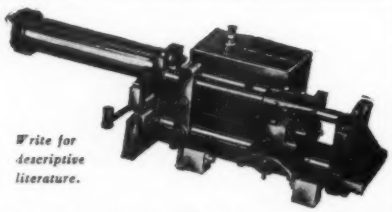
Send For Bulletin

ACME TOOL COMPANY
73 W. Broadway, New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2062

COOPER WEYMOUTH
OPEN THROAT
AIR OPERATED SLIDE FEED
For Power Press Operation

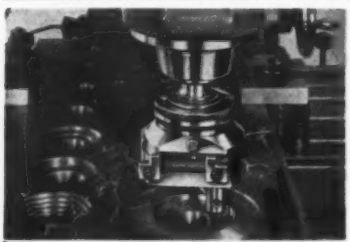
Operates on standard shop air lines. Easy to set up and adjust, holds to extreme accuracy. Made in five sizes. Feeds lengths to 36", up to 18" wide on mechanical and hydraulic presses.



Write for descriptive literature.

COOPER WEYMOUTH, INC., 277 Noble Ave., Bridgeport 8, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 2063



SAVE TIME — DO A BETTER JOB
With Higher Precision When You Use
The Wohlhaupter MASTERHEAD
— IT THINKS FOR ITSELF —
In One Setup and on One Machine . . .

- Does Boring, Facing, Recessing, Undercutting, Underfacing, Outside Turning, etc.
- Automatic Feeds
- Automatic End Release
- Increases Capacity of Your Present Equipment
- Increases Production, Makes Better Finished Work
- Nine Models Available for Work up to 36¼" dia.

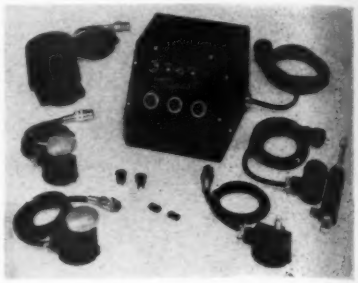
Also Taper Cutting Heads

Sole Factory Agent: KARL A. NEISE, Dept. TP, 404 4th Ave., N. Y. 16, N. Y.

NEISE MODERN TOOLS

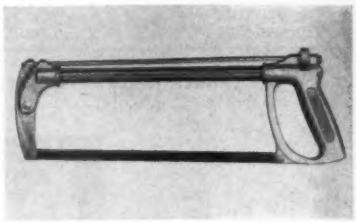
CIRCLE INFORM-A-GRAM KEY NO. 2064

Increase Production, Eliminate Rejects, and lessen downtime from jamming or die damage with a new electric combination master control. The "Trippit" brings automation-like efficiency to the operation of power



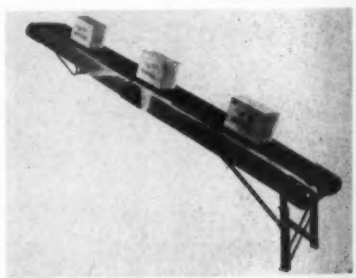
presses, shears, and brakes. For hand-fed and secondary operations, the piece part when properly nested, trips the press automatically. General Automation Corp., 65 S. Broadway, Yonkers, N. Y., or —
Circle Inform-A-Gram No. A65.

An Improved Hack Saw Frame has been designed for use with 12" blades. Milford Master Grip No. 4 equipped with a Milford flexible resistor 12"-18 tooth blade is constructed of light, die-cast aluminum.



The frame which is 16" long, features a storage chamber that makes the right blade immediately available. The Henry G. Thompson & Son Co., New Haven, Conn., or —
Circle Inform-A-Gram No. A66.

This Lightweight Belt Conveyor has a total distributed load capacity of 250 lbs. It is 16" wide in lengths ranging from 6' to 20'. The 10"-wide belt of 3-ply duck moves at the rate of 65 fpm. The conveyor is also



available in a heavier model which is 18" wide with a 12" belt and can handle loads up to 300 lbs. The Colson Corp., Elyria, O., or —
Circle Inform-A-Gram No. A67.

Drill Hardened Steels without Annealing –

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

Also makers of— **BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS** *Write for information*

CIRCLE INFORM-A-GRAM KEY NO. 2071

the IMP "HOLD-DOWN" VISE is different!

No hammering, no parallels . . . work is seated accurately and securely in 9 seconds or less with the IMP. Closer tolerances, easy to clean, one hand operation are additional reasons why you save production time, eliminate second grinding operations and cut costs with the IMP . . . perfect for surface grinding of nonferrous parts, too!

30 day free trial... ***Try the IMP in your shop for 30 days . . . if it isn't all we say it is, return it without obligation.***

Write for FREE IMP "HOLD-DOWN" Brochure

ILLINOIS METAL PRODUCTS
711 N. HUDSON ST. • CHICAGO 10, ILLINOIS
Phone: SUperior 7-3761-3762

CIRCLE INFORM-A-GRAM KEY NO. 2072

NOW... A Low-Cost Stock Guide

NEW DANLY ROLLER STOCK GUIDES AND GUIDE RAILS

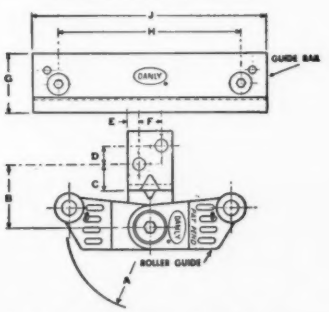
READY MADE—QUICK TO INSTALL

Versatile...for use on dies or in any operation where coil or strip stock must be guided.

Low-cost...the cost is only a fraction of the shop expense necessary to tailormake a guide.

Rugged... constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

Roller Guide, Large.....$4.50 each
Roller Guide, Small.....4.00 each
Guide Rail.....$3.50 box of five (all one size)
(Discount for quantity orders)



Roller Guide Dimensions, Inches

	Cat. No.	A	B	C	D	E	F
Roller Guide Large	9-70-6	2 3/64	1 13/32	3/8	1/4	5/16	7/16
Roller Guide Small	9-60-6	1 27/64	1 1/16	7/16	5/16	3/16	3/8

Danly Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.

Guide Rail Dimensions, Inches

	Cat. No.	Max. Stock Thickness	G	H	J
Guide Rail	9-8025-6	.025	1	3 1/8	4
	9-8045-6	.045	1	3 1/8	4
	9-8080-6	.080	1	3 1/8	4
	9-8125-6	.125	1	3 1/8	4

Danly Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.

For immediate delivery, specify catalog number and mail orders to

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2073

Also Taper Cutting Heads
Work up to 36¼" dia.

Sole Factory Agent: KARL A. NEISE, Dept. TP, 404 4th Ave., N. Y. 16, N. Y.

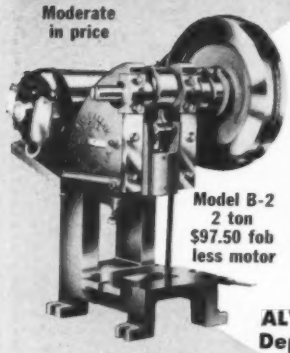
NEISE MODERNTOOLS

CIRCLE INFORM-A-GRAM KEY NO. 2064

Circle Inform-A-Gram No. A67.

HEAVY DUTY BENCH TYPE ALLEN PUNCH PRESSES

Moderate in price



Model B-2
2 ton
$97.50 fob
less motor

Powerful, Dependable and Economical

Many Popular Models
1 to 5 ton capacities
Fully guaranteed

See Your Supply Dealer or write for FREE punch press catalog giving complete information, specifications and prices on our complete line of bench type punch presses.

ALVA ALLEN INDUSTRIES
Dept. TP Clinton, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 2081

STANDARD FLUSH PIN GAGES

Precision Built
of Precision Ground
Oil Hardened
Tool Steel

Can be Furnished with Indicator Mountings
Completely Ground to Your Specifications and Ready for Use
No Design Necessary
Deliverable from Stock

Write for Latest Catalog as well as our Automatic Free Service.
Representatives Wanted for Most Industrial Areas

UNION GAGE CORP.
711 Lehigh Avenue Tel. Murdock 6-9150 UNION, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2082

These 2 free booklets can short cut Statistical Jobs

(Statistical book) 64 *pages*
(Quality Control book) 36 *pages*

This coupon brings two booklets that have proved highly valuable to production managers and engineers throughout the country. No obligation is involved. Just mail this coupon.

MONROE
CALCULATING · ADDING · ACCOUNTING · DATA PROCESSING MACHINES

Monroe Calculating Machine Co., Inc.
Orange, N. J. TP-6

Mail me my free copies of *"Some Short Cut Statistical Methods"* and *"Quality Control Short Cuts,"* as shown above.

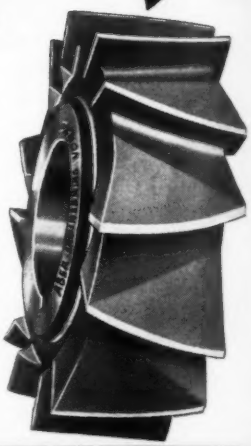
NAME .....
BUSINESS .....
ADDRESS .....
.....

CIRCLE INFORM-A-GRAM KEY NO. 2083

ABER Curved Tooth MILLING CUTTERS ARE Better...

here's 5 reasons Why

1. Give More Accurate Control of Limits and Finish
2. Elimination of Chatter and Breakage
3. Extended Cutter Life
4. Better Performance
5. Increased Production



Patented Curved Tooth Design of all *Aber Cutters* permits faster, easier operation, because the curve of the tooth face is built up and strengthened at the corner of the tooth which first enters the cut. This makes possible a *SHEARING ACTION* and eliminates the shock of contact with the work. Dissipation of heat is faster, eliminating friction. . . . Write today for complete information.

FREE DATA on "How to Sharpen Curved Tooth Milling Cutters".

ABER ENGINEERING WORKS
WATERFORD, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 2084

a PROCUNIER TAPPER pays for itself!

Built-in features and operating advantages increase production — reduce costs!

Any way you look at it—you save and gain with Procunier Tappers. Countless reports indicate tremendous savings on taps, automatic production increases, drastic reduction in parts spoilage, less operator fatigue, fewer "down hours" and precision accuracy in threads and tapped holes. Taking these gains and savings into consideration you can quickly see why Procunier heads "pay for themselves in just a short time!"

Procunier heads offer high speed, quiet operation, a new, powerful drive — with finger tip pressure; economical lightness, "long life" ruggedness and an accuracy and dependability you can consistently count upon! And, there's a versatile model for practically every tapping operation.

Send for FREE Brochure

Find out how you can benefit with Procunier. Get the full construction details — the "inside story" on why Procunier has led the field for more than 30 years. Write today — now.

PROCUNIER SAFETY CHUCK COMPANY
12-14 S. Clinton St., Dept. 6, Chicago 6, Ill.

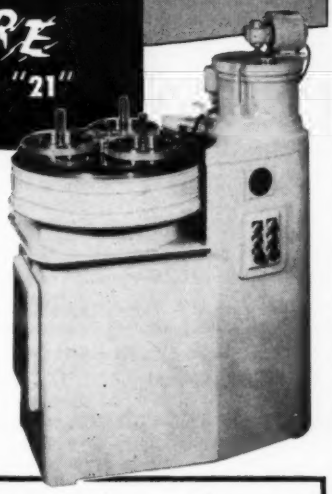
CIRCLE INFORM-A-GRAM KEY NO. 2085

CIRCLE INFORM-A-GRAM KEY NO. 2072

CIRCLE INFORM-A-GRAM KEY NO. 2073

NEW! Push-Button micro-precision flat lapping

SPITFIRE GYRO-MATIC "21" Lapping Machine



- *Automatic! Easy Push-Button operation!*
- *Super Precise! Produces optical flatness to .0000116!*
- *Economical! Saves time, work, labor flat lapping any material!*

The new Gyro-Matic "21" means any firm . . . your firm . . . can now have finest finishing on any material! Cost is so low . . . performance so perfect . . . revolutionary advanced features so important—the Gyro-Matic "21" stands out as the most significant step forward in flat lapping in years!

18" and 24" flat lapping machines also available.

SPITFIRE ROLLER LAPPING MACHINES

Both upright and bench type models specially designed for micro-finishing cylinders, plug gages, shoulder parts, etc. in ⅓ the time!

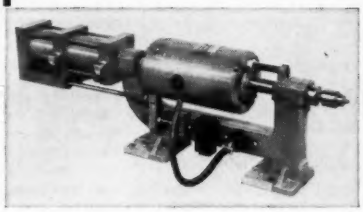
Simulates figure 8 motion of hand lapping	*Simple-to-operate*	*Economically provides highest level quality control*

Write for complete detailed information *today!*

SPITFIRE Tool Co.
2937 N. Pulaski Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 2091

AUTOMATIC DRILL UNIT



Complete, Compact
ELECTRIC MOTOR SPINDLE
with Hydraulically Controlled
Air Cylinder Providing Feed

3 SIZES cover Drilling Range from #80 to ½" — Units can be Mounted in Any Position to Build Special Machines

MODEL 111	#80 to ⅛"	2,500 to 15,000 RPM
MODEL 113	1/16" to ¼"	2,000 to 13,800 RPM
MODEL 603	⅛" to ½"	600 to 4,000 RPM

Write for Descriptive Bulletin and Prices

The ELECTRO-MECHANO CO.
260 E. ERIE STREET • MILWAUKEE 2, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 2092

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery, Sheet Metal Stampings and Assemblies.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, Ohio.
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

Buy U. S. Savings Bonds

TRY US FOR *YOUR*

- DRYSEAL PIPE PLUGS
- REDUCER BUSHINGS

STEEL - BRASS - ALUMINUM

⅛" thru ¾" ctsk and hex head

We will quote on hundreds or millions!

WRITE FOR PRICES

PATERSON MFG. CO., DEPT.-TP P.O. BOX 5102 FLINT, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 2093

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio. WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines. Special Machinery, Tools, Dies, Jigs, Fixtures.

Magnetic Base Indicator holders

Erick Magna Holder
Model 2008
Only $5.45
Precision adjustment like surface gage
Stainless holding rod set in ball socket
See your dealer or write for catalogue 755 on the most complete line of magnetic base units and access. mfg'd.
Powerful 50 lb. pull base

CULLEN MFG. CO., RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 2094

CIRCLE INFORM-A-GRAM KEY NO. 2083

CIRCLE INFORM-A-GRAM KEY NO. 2085

ADVERTISERS INDEX

Aber Engrg. Works, Inc. 208
Accurate Bushings Co. 156
Ace Drill Bushing Co., Inc. 114
Ace Drill Corp. 204
Acme Industrial Co. 54
Acme Tool Co. 206
Acro Metal Stamping Co. 168
Advance Tables 154
Aget Mfg. Co. 181
A. K. Tool Co., Inc. 191
Aldridge Industrial Oils, Inc. 191
Alina Corp. 152
Alkon Products Corp. 205
Allegheny Ludlum Steel Corp. 111
Allen, Alva F. 208
Allen Mfg. Co. 59
Allied Products Corp.
Richard Brothers Punch Div. 10
Aloris Tool Co., Inc. 189
American Pullmax Co., Inc. 32
Applied Mechanics Corp. 154
Armstrong Bros. Tool Co. 134
Avildsen Tools & Machines, Inc. 191

Baird Machine Co., The 18
Balas Collet Mfg. Co. 7
Barber-Colman Co.
Hendey Machine Div. 112
Bausch & Lomb Optical Co. ...43, 132, 179
Bay State Abrasive Products Co. 91
Bearings, Inc. 171
Bellows Co., The 23
Black Drill Co., Inc. 207
Bliss Co., E. W., Press Div. 50
Branch Mfg. Co. 176
Bryant Chucking Grinder Co. 193
Burg Tool Mfg. Co. 133
Busch Co., J. C. 199
Bushman Co., H. L. 190

Central Safety Equipment Co. 195
Chandler Tool Co. 180
Chaso-Royco Tool Co., Inc. 191
Chicago Screw Co. 97
Chicago Tool & Engrg. Co. 203
Cincinnati Milling Machine Co., The .. 3
Clark Co., Robert H. 123
Cleveland Crane & Engrg. Co., The ... 16
Cleveland Grinding Machine Co., The ..148
Columbia International Corp. 106
Comet Tool Co. 189
Commercial & Industrial Uniform Co. ..183
Connors & Davis Sales Corp. 201
Continental Tool Works,
Div. Ex-Cell-O Corp. 65
Cook, Inc., Lawrence H. 197
Cooper Weymouth, Inc. 206
Crown Industrial Products Co. 183
Cullen Mfg. Co. 209

Dake Corp. 167
Danly Machine Specialties, Inc. ...29, 207
Darwin & Milner, Inc. 104
Dayton Rogers Mfg. Co. 52, 148, 183
Detroit Die Set Corp. 34
Detterbeck Co., The George L. 119
DeVlieg Machine Co. 15
DeVlieg Microbore Co. 37
Dickerman Mfg. Co., H. E. 153
Dilley Mfg. Co. 148
DoAll Co., The 22
Durable Punch & Die Co. 151
Durant Tool Supply Co. 191, 192
Dykem Co., The 190

Eclipse Counterbore Co. 143
Economy Tool & Machine Co. 186
Edlund Machinery Co. 6
Eisler Engineering Co., Inc. 194
Electro-Mechano Co., The 209
Elgin National Watch Co. 195
Elox Corp. of Michigan 33
Enco Mfg. Co. 116
Enterprise Machine Parts Co. 176
Erickson Tool Co. 62
Ettco Tool Co. 163
Ex-Cell-O Corp.
Continental Tool Works Div. 65

Famco Machine Co. 117
Federal Tool & Mfg. Co. 179
Federal Tool Corp. 186
Fenn Mfg. Co. 24
Ferguson Machine & Tool Co., Inc. 130
Firth Sterling, Inc. 131
Fonda Gage Co., D.C. 169
Ford Mfg. Co., Inc., M.A. 192
Frick-Gallagher Mfg. Co., The 181

Gaertner Scientific Corp., The 157
Gage Co. 182
Gardner-Denver Co.,
Keller Tool Div. 12
Gas Appliance Service, Inc. 124
Gatco Rotary Bushing Co. 178
Gorton Machine Co., George 61
Graphic Systems 116
Graymills Corp. 150
Greist Mfg. Co., The 166
Grip Nut Co. 195

Hamilton Tool Co., The 137, 139, 141
Hannifin Corp. 124
Hanson-Whitney Co. 48
Harco Engrg. Co. 192
Hardinge Brothers, Inc. 44
Hartford Special Machinery Co., The .. 17
Heimann Mfg. Co. 197
Hendey Machine Div.,
Barber-Colman Co. 112
Hevi-Duty Electric Co. 142
Hoern & Dilts Div.,
New Britain Machine Co., The 56
Horberg Gage Co., The 193
Hovis Screwlock Co. 165
Huebner Publications,
Inc. 96, 101, 116, 158
Huppert Co., K. H. 159
Hutchinson Co., William T. 188

Illinois Metal Products 207
Industrial Tectonics, Inc. 200
Ingersoll-Rand Co. 120

Jaco Devices, Inc. 183
Jacobs Mfg. Co. 60
Jarvis Corp. 36
Jergens Tool Specialty Co. 205
Johnson Gas Appliance Co. 152
Johnson & Bassett, Inc. 194
Jo-Line Tools, Inc. 203
Jones & Lamson Machine Co.. 19, 108, 145

Kalamazoo Tank & Silo Co.,
Machine Tool Div. 28
Kearney & Trecker Corp.
Special Machinery Div. 49
Keller Tool Div.,
Gardner-Denver Co. 12
Kenco Mfg. Co. 203
Kidde Precision Tool Corp. 188, 190
Kling Brothers Engrg. Works 164

Lakeside Steel Improvement Co., The ..205
Lamina Dies & Tools, Inc. 212
Lapeer Mfg. Co. 193
Lavallee & Ide, Inc. 4
Laystrom Mfg. Co. 109
Lee Co., K. O. 198
Levin & Son, Inc., Louis 177
Lincoln Park Industries 170
Littell Machine Co., F. J. 200
Logan Engineering Co. 135
Logansport Machine Co., Inc. 157
Lovejoy Flexible Coupling Co. 185
Lucas & Son, Inc., J. L. 185
Lufkin Rule Co., The 30

Madison-Kipp Corp. 198
Magnaflux Corp. 159
Markall Products Co. 181
Mayline Co. 187
Mead Specialties Co. 119
Metal Carbides Corp. 53
Meyers Co., Inc., W. F. 154
Michigan Chrome & Chemical Co. 152
Micro Drill Guide 189
Micromatic Hone Corp. 95
Micrometrical Mfg. Co. 146
Milne & Co., A. 100
Minnesota Mining & Mfg. Co. 123
Modern Industrial Engrg. Co. 160
Mohawk Tools, Inc. 55
Monroe Calculating Machine Co., Inc. .208
Moore Special Tool Co., Inc. 103
Morrison Engrg. Co. 154

National Acme Co., The 45
National Broach & Machine Co. 35
National Tool Salvage Co. 158
Nebel Machine Tool Corp,
Smith & Mills Shaper Div. 185
Neise, Karl A. 196, 198, 201, 206
New Britain Machine Co., The 127
New Britain Machine Co., The
Hoern & Dilts Div. 56
Niagara Machine & Tool Works 20
Nilson Machine Co., A. H. 125
Nobur Mfg. Co. 154
Nord Corp. 180
Norton Co. 93, 138
Numberall Stamp & Tool Co. 184

Oliver Instrument Co. 136
O'Neil-Irwin Mfg. Co. 64
Ortman-Miller Machine Co. 99

Parker-Majestic, Inc. 129
Paterson Mfg. Co. 209
Perfex Gage & Tool Co. 188
Perkins Machine Co. 155
Pivot Punch & Die Corp. 178
Pope Machine Corp. 144
Portage Machine Co., The 11
Porter, Inc., H. K. 126
Porter Precision Products 147
Pratt & Whitney Co., Inc. 102
Precision Tool Mfg. Co. of Ill. 199
Preis Engraving Machine, H.P. 196
Procunier Safety Chuck Co. 208
Production Devices, Inc. 198
Producto Machine Co. 107, 152
Punch Products Corp. 118
Putnam Tool Co. 39

R. B. Tool Co., Inc. 204
Reid Tool Supply Co. 202
Reliant Industries 26
Rice Pump & Machine Co. 196
Richard Brothers Punch Div.,
Allied Products Corp. 10
Richards Co., J. A. 190
Rockwin Mfg. Co. 202
Roll Feeds Corp. 181
Rotor Tool Co. 13
Royal Products 116

Scherr Co., Inc., George 193, 194, 203
Scully-Jones & Co. 140
Service Machine Co. 190
Severance Tool Industries, Inc. 123
Shore Instrument & Mfg. Co., Inc. 188
Sibley Machine & Foundry Corp. 27
Simonds Abrasive Co. 105
Small Lot Stamping Co. 202
Smith & Mills Shaper Div.,
Nebel Machine Tool Corp. 185
South Bend Lathe Works 179
Spiral Step Tool Co. 182
Spitfire Tool Co. 209
Standard Gage Co., Inc. 25
Standard Parts Co. 110
Standard Pressed Steel Co. 8
Standard Tool & Mfg. Co. 184
Star Stainless Screw Co. 204
Stebar Co. 192
Sturdy Broaching Service 183
Sturtevant Co., P. A. 116
Superior Steel Products Corp. 122
Sutton Tool Co. 2

Tannewitz Works, The 197
Thermo Electric Mfg. Co. 195
Threadwell Tap & Die Co. 14
Tietzmann Tool Corp. 178, 199
Timken Roller Bearing Co.
Steel & Tube Div. 31
Tomco Products Co. 191
Tomkins-Johnson Co. 149
Twentieth Century Mfg. Co. 124

Union Gage Corp. 208
United States Diamond Wheel Co. 197
United States Drill Head Co., The 177
U. S. Tool Co., Inc. 98
Universal Engineering Co. 9

Vascoloy-Ramet Corp. 5
Verson Allsteel Press Co. 1
Vulcan Tool Co. 187

Wales-Strippit Corp. 47
Walls Sales Corp. 196
Wardwell Mfg. Co., The 157
Watts Brothers Tool Works 194
Weldon Tool Co. 200
Wesson Co. 161
Wheelock, Lovejoy & Co., Inc. 115
Whistler & Sons, Inc., S.B. 119
Whitman & Barnes, Inc. 46
Wilson Automation Co. 211
Wirth & Son, Inc., Carl 206
Wittek Mfg. Co. 187
WLS Stamping Co. 177
Wohlnip Products, Inc. 197

Yoder Co., The 38
Yost Mfg. Co. 180

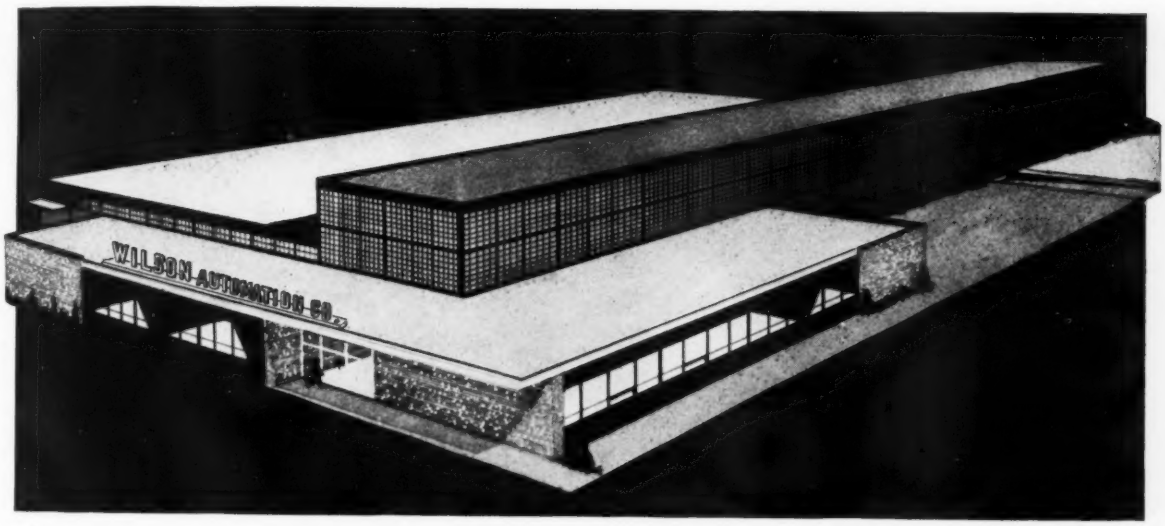
AUTOMATION is more than a new word

with WILSON . . . it's our business

We are one of the pioneers in the revolutionary field of automation. Wilson automation installations are functioning day after day, smoothly and efficiently in some of the largest plants in the nation. We have built automation machines, ranging in size from single units to gigantic lines 4,400 feet long (from 1 ton to 40 tons). Sooner or later, you are bound to get around to the point where you will need automation in your business. When you do, remember Wilson. We have the know-how, the ability and experienced engineering staff to take good care of your problem.

A PARTIAL LIST OF WILSON AUTOMATION USERS

CADILLAC DIVISION — CHEVROLET — DODGE DIVISION — FORD MOTOR COMPANY
GENERAL ELECTRIC — OLDSMOBILE DIVISION — PLYMOUTH DIVISION
PONTIAC MOTORS — STUDEBAKER-PACKARD



THE NEW HOME OF WILSON AUTOMATION COMPANY

This new building was made necessary by the rapid growth of our business, due to the greatly increased demand for Wilson Automation in the automotive and other industries. Modern and functional in design, this new plant incorporates all the facilities and productive capacity for building the most extensive automation lines for the requirements of modern automated production.

We will be glad to discuss with you how Automation can be applied profitably to your specific operations.

WILSON AUTOMATION COMPANY

27101 GROESBECK HIGHWAY AT E. ELEVEN MILE ROAD

P. O. BOX 3855, DETROIT 5, MICHIGAN — PHONES: DETROIT ZONE — DREXEL 1-2110 — SUBURBAN ZONE — PRESCOTT 6-8000

HUEBNER PUBLICATIONS, INC.
1975 Lee Rd., Cleveland 18, O.
RETURN POSTAGE GUARANTEED

SEE THESE *New* GUIDE PIN BUSHINGS . . .

SHORT SHOULDER TYPE—For special applications. Available in non-seizing bronze-plated hardened steel or solid Ampco bronze.

LONG SHOULDER TYPE—For use where pin should remain in bushing. Many sizes available in non-seizing bronze-plated steel.

in this new Lamina catalog!

If you build or use die sets, you'll want your free copy of the new Lamina Catalog *in a hurry!* This big new book contains 36 pages complete with illustrations, applications, dimensions and prices of more than 800 Lamina Guide Pins, Guide Pin Bushings and accessories. New models, sizes, styles and materials make the new Lamina line the most complete ever offered to men who want to cut press operating costs and improve die and press efficiency. *Write us now for your free copy.*

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN